THE HEATING AND VENTILATING MAGAZINE

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

Vol. XVI. No. 12
$2.00 a year. 20 cents a copy

DECEMBER, 1919

Published at Cooperstown, N. Y.
New York Office, 1123 Broadway

GURNEY HEATERS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
GURNEY HEATER MANUFACTURING CO.
NEW YORK OFFICE 11 E. 42ND ST. 188-200 FRANKLIN ST. BOSTON.

MASON REDUCING VALVES
and other PRESSURE REGULATORS
for all conditions of service
MASON REGULATOR CO., 15 Medway St Boston Mass.

DAVIS VALVE
STEAM SAVERS SINCE 1875
SPECIALTIES
PRESSURE REGULATORS, BACK PRESSURE VALVES, EXHAUST RELIEF VALVES, STOP AND CHECK VALVES, FLOAT VALVES, BALANCED VALVES, STEAM TRAPS AND OTHER VALVE SPECIALTIES FOR HEATING PLANTS
SEND FOR LATEST CATALOG
G. M. DAVIS REGULATOR CO.
436 MILWAUKEE AVE., CHICAGO

ROOM TEMPERATURES
Every Public Building Should Be Equipped With
BRISTOL'S
RECORDING THERMOMETERS
As a safeguard to health and sanitation. They prove to the heating engineer whether the proper distribution of heat is being maintained.
Bristol's Recording Thermometers can be supplied in many different types and finishes for any room desired.
Ask for Bulletin T-204
THE BRISTOL COMPANY Waterbury, Conn.

ROSS
FEED-WATER FILTERS
Will Keep Oil Out of Your Boiler
Regulating Valves for Water, Steam, Air
Ross Valve Mfg. Co. Troy, N.Y.
Ask for List of Users

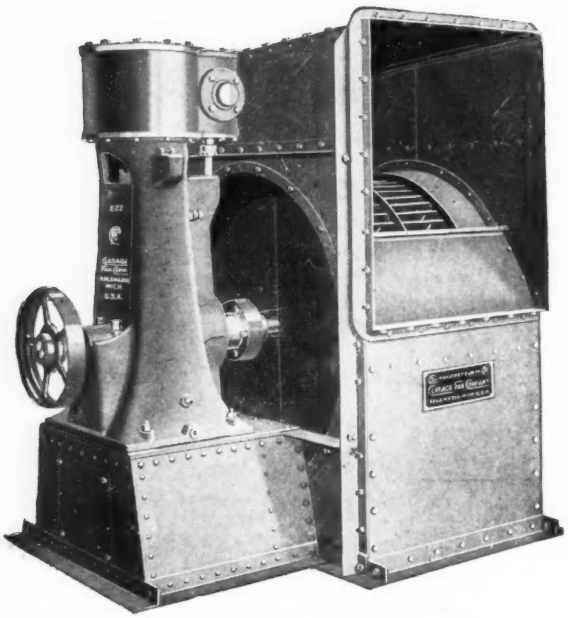
DOLE
PACKLESS RADIATOR VALVES
Insures Satisfaction. A Valve for every System. Write for Catalogue and Discounts
THE DOLE VALVE COMPANY
208 NORTH FIFTH AVENUE CHICAGO.

Entered as second-class Matter at the Post-Office in Cooperstown, N. Y

Copyright 1919 by Heating and Ventilating Magazine Co

CLARAGE
KALAMAZOO

"Good Construction is Important"



Clarage Multiblade Fan, direct connected to Clarage Type "V" Engine

It's a Joy

to see a Clarage Multiblade Fan in operation on a heating and ventilating job.

It runs like a top—there is no vibration—the fan is practically noiseless.

And the bearings! There isn't a drop of oil oozing out of the bearing case and getting the floor sloppy and dirty.

BETTER STILL—you can return to the installation, years later, and find *that same* Clarage Multiblade Fan delivering warmed air in winter, cooled air in summer, as before—operating just as quietly—giving perfect satisfaction.

Write us and find out where there is a Clarage Multiblade Fan installation in your vicinity—then see for yourself.

Our catalog H-51 gives the "reasons why." Get your copy today.

CLARAGE FAN COMPANY
KALAMAZOO, MICHIGAN

Engineering and Sales Offices in Principle Cities

The Heating and Ventilating Magazine

VOL. XVI. NO. 11

Contents for December, 1919

Radiation Loss in Uncovered Galvanized Iron Ducts 23
With Chart for Figuring Drop in Temperature of Air per 100 Ft. of Run.

Notes on the Operation of Condensation Meters . . . *F. A. Tucker* 26

The Siphon and Its Relation to Heating Work . . *T. W. Reynolds* 29
How this Principle is Applied to Such Devices as Steam Gauges, Cocks, Manometers, Draft Gauges, Loop Seals and Oil Separators.

United States Fuel Administration Revived 35

Fuel Oil Rules Promulgated by the New York City Board of Standards and Appeals 37

American Society of Heating and Ventilating Engineers 39
New York Chapter Discusses "Oil as a Substitute Fuel."
Western New York Chapter Given New Data on Heat Transmission.
Director John R. Allen of the Heating Research Bureau a Guest of the Minnesota Chapter.
Pittsburgh Chapter Meets at Bureau of Mines Building.
Illinois Chapter Holds Joint Meeting with Western Society of Engineers.

Why Draft is More Noticeable on the Discharge Side of a Fan than on Its Suction Side 43

Air Cooling and Refrigeration 45
"Climate Doctors" the Latest Term for Air Conditioning Engineers.

Modern Practice in Vapor Heating 47
XVI—The Nefco Automatic Vacuum-Vapor System.

The Weather for October, 1919 50
New York, Boston, Pittsburgh, Chicago and St. Louis.

Correspondence 52
Vento Heater Connections.
Efficiency of Direct Radiators in Rooms Ventilated by Exhaust Fans.
Heating Factory Buildings with Gas.
Burning Fuel Oil in House-Heating Boilers.

The Reconstruction Era 59

The "Quantity Survey" Plan in Estimating 60

"Cost-Plus" Contract with Unusual Features 61

Legal Decisions 62
Construction of Heating Plant Installation Contract—Architect's Certificate—Clause as to Completion.
Contract Provisions on Letter Heads not Binding.

The Up-to-Date Drafting Room 63

Standard Heating and Ventilating Data Sheets 72
132-F—Vapor Heating—The Broomell System (Concluded).
136—Fans—General.
136-A—Fans—Hand and Discharge.
168-A—Drives—Belt—Power Transmitted.
Advertisers' Index on Page 114.

YEARLY SUBSCRIPTION $2.00 **SINGLE COPIES, 20 CENTS**
Published monthly at Cooperstown, N. Y., by the Heating and Ventilating Magazine Co.
Executive and Editorial Offices 1123 Broadway, New York

14 Lbs. Pressure downward

AS soon as steam strikes the sensitive corrugated disc, the disc moves towards its seat and exerts a maximum downward pressure of 14 pounds. This force is exerted uniformly by the vaporization of a liquid inside the corrugated disc.

This downward pressure causes the trap to be effective in spite of any grease and foreign matter which might have a tendency to accumulate on the seat.

The DUNHAM HEATING SERVICE

In action, the disc is alternately on and off its seat depending on the rate at which the steam is condensed in the radiator. Its action is always positive—is never sluggish—and can be depended on under conditions varying from 10-pounds pressure to 15 inches of vacuum. Passes all water; wastes no steam.

Write for complete details

C. A. DUNHAM CO., Fisher Bldg., CHICAGO

Factories: Marshalltown, Iowa; Toronto, Canada

Branches in 36 cities in the United States and Canada

London: 64 Regent House, Regent Street, W. 1.

Paris: Establts, Munzing & Cie, 47, Rue de la Fontaine-au-Roi

JOHNSON SYSTEM
SUPERIOR HEAT - CONTROL

The All-Metal Apparatus

No Rubber Diaphragms in either Thermostats or Valves

The Only System Constructed of Nothing but Metal

JOHNSON SERVICE COMPANY
MILWAUKEE - U. S. A.

THE HEATING AND VENTILATING MAGAZINE

DECEMBER, 1919

RADIATION LOSS IN UNCOVERED GALVANIZED-IRON DUCTS

WITH CHART FOR FIGURING DROP IN TEMPERATURE OF AIR PER 100 FT. OF RUN

The uncovered galvanized-iron duct used for fan blast heating, especially in shops and similar buildings, has a considerable radiation loss to consider and in long buildings this will have the effect of overheating the portion near the fan location and underheating the parts farthest removed unless some means is taken to counteract the effect of such losses. Unevenness of heating is due to the same cause but is produced in two different ways.

Of course, it is self-evident that if the air arrives at the end of the duct considerably cooled down its heating ability is correspondingly lessened. Also if the air feeding the portions of the building near the fan is fully up to temperature such portions of the building will heat more rapidly. Added to this is the fact that practically all heat lost out of the air going to the far end is radiated from the sides of the duct into the portions of the building nearer the fan, thus increasing the unbalancing of the temperature in the near and far ends.

Many designers make allowances for such losses. These modifications are to a greater or less extent arbitrary and, in the writer's opinion, are pretty much guess work. On the other hand, too great a refinement in this matter is unnecessary as it is only required to have a logical working basis on which to calculate the allowances necessary.

With the idea of presenting a chart sufficiently flexible to serve all ordinary cases, yet simple to read and arranged so as to eliminate all the more complicated calculations, the curves shown in Fig. 1 have been prepared.

FORMULA USED IN DESIGNING CHART.

In designing these curves certain assumptions were made which will be noted as they occur in the following discussion. The formula finally used to determine these curves which indicate the drop in air temperature in degrees F. per 100 ft. of run for any size of duct between 8 in. diameter and 8 ft. diameter at any velocity between 200 and 3000 ft. per minute is the following:

$$(1)\quad V = \frac{153}{D} \times R$$

when V = velocity of air in pipe in feet per minute,

D = Number of degrees of temperature drop in the duct for 100-ft. run,

R = ratio of the area of the pipe to circumference or $\frac{C}{A}$

153 = a constant the derivation of which is later explained.

This formula is developed by the following method:

The radiation in B. T. U. per lineal

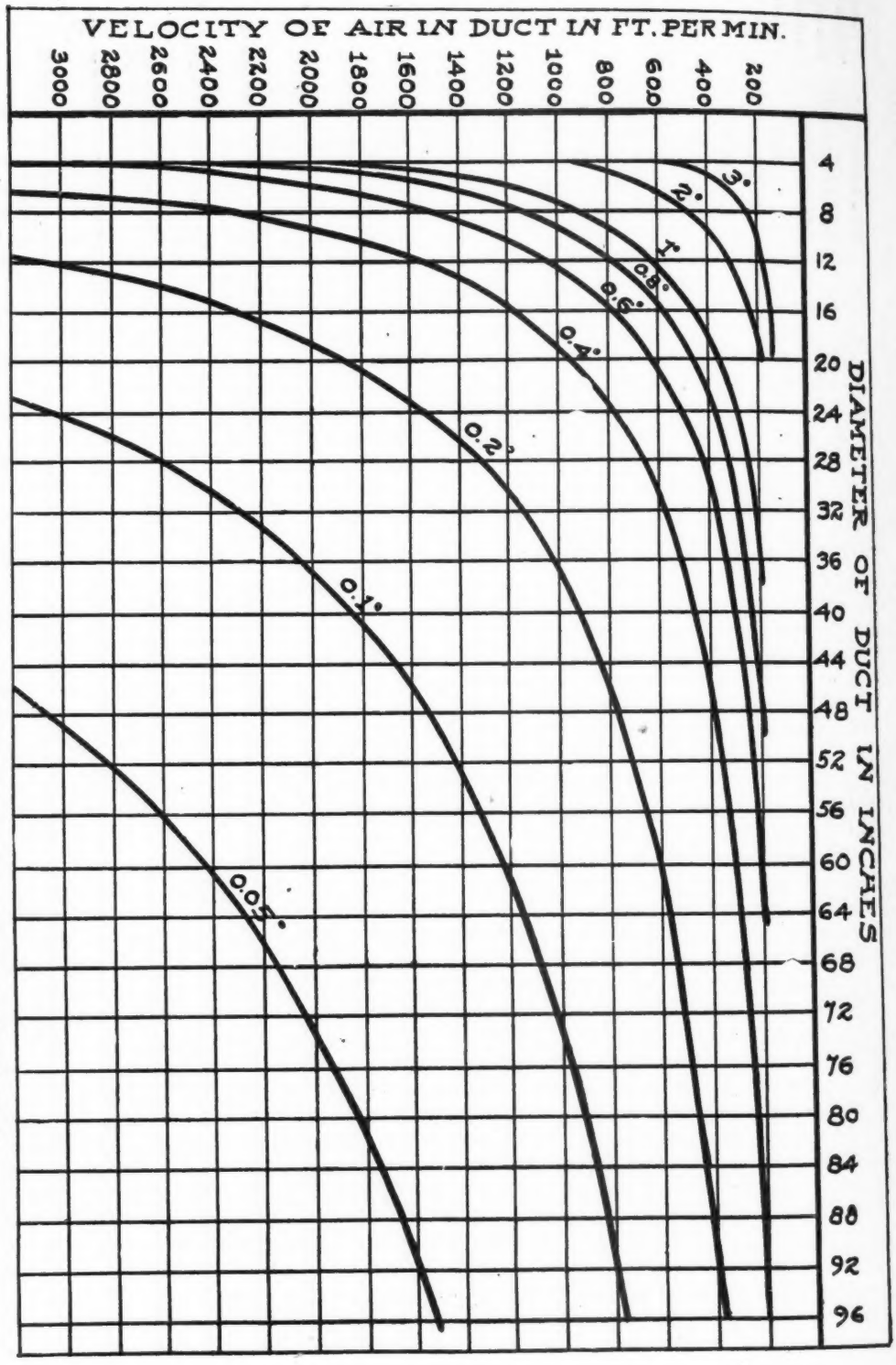


FIG. 1—DROP IN AIR TEMPERATURE IN DEGREES F. FOR UNCOVERED GALVANIZED IRON DUCTS PER DEGREE AVERAGE TEMPERATURE DIFFERENCE PER 100-FT. RUN.

foot of duct per hour from a given size of galvanized duct for 1° average temperature difference between the air inside the duct and the air outside is obtained by the formula:

(2) $C \times k =$ B. T. U. loss per lineal foot per hour,

When C = the circumference of the duct in feet,

k = the co-efficient of heat transmission on per square feet per degree average temperature difference between the air inside and outside the duct.

Then for a 100-ft. run the loss will be

(3) $100 \times C \times k =$ B. T. U. loss per 100 ft. of run.

The co-efficient "k" will be about the same as in a pressed metal radiator upon which careful tests have shown an efficiency of 1.53 per degree for "k." Then substituting this value for "k" in (3) the formula becomes

(4) $100\ C \times 1.53 =$ B. T. U. lost per 100-ft. run or

(5) $153\ C =$ B. T. U. lost per 100-ft. run

The average temperature of air used in ducts for hot blast heating approximates 120° F. at which temperature air with about 30% relative humidity will have about 60 cu. ft. lowered 1° for each B. T. U. radiated. Therefore the quantity of air which will be dropped 1° by the radiation from the duct will be the B. T. U. lost (5) times 60 or

(6) $153\ C \times 60 =$ cubic feet necessary to have 1° drop.

There must be just enough air passing through the duct to meet this loss, or there may be more, or there may be less. To determine the air quantity in cubic feet per hour passing through the duct the formula is

(7) $A \times V \times 60 =$ c. f. h.

in which A = area of duct in square feet.

V = velocity of air in duct in feet per minute.

60 = number of minutes in an hour.

C. f. h. = cubic feet per hour.

Knowing the number of cubic feet it will be necessary to drop 1° to supply the B. T. U. loss in the 100 ft. of run by (6), and knowing the cubic feet actually passing by (7), formula (6) divided by formula (7) will give the actual temperature drop for any given velocity and size of duct. Thus

(8) $$\frac{153\ C \times 60}{A \times V \times 60} =$$ degrees drop in air

or

(9) $$\frac{C \times 153}{A \times V} =$$ degrees drop in air

If 1° drop is assumed the velocity in a given size of duct is easily computed by the formula (9) modified to

(10) $$\frac{C \times 153}{A} = V \times 1°$$

or

(11) $$V = \frac{153\ C}{A}$$

The ratio of C to A is a constant R for any given size of ducts and runs

Size Duct Inches Diam.	$\frac{C}{A} = R$
8	6.00
12	4.00
16	3.00
20	2.40
24	2.00
48	1.00
60	.80
72	.66 2/3
84	.56
96	.50

Therefore an 8-in duct reduces formula (11) to

(12) $V = 153 \times 6.00$ or

$V = 918$ f. p. m. velocity for 1° drop in 8-in. duct and similarly for 12-in. ducts

$V = 153 \times 4 = 612$ ft. per minute or for a 96-in. duct

$V = 153 \times 0.5 = 76$ ft. per minute.

Having the velocity for 1° drop other drops are easily computed, the velocity being increased or decreased in direct proportion to the quantity of air handled and therefore in inverse proportion to the temperature drop.

Thus when 10,000 cu. ft. of air drops 1° in going through a certain duct twice the amount, or 20,000 cu. ft. (at twice the velocity, V) would drop only 1/2 ×

1°, or 1/2° and one-half the amount (at one-half the velocity, V) would drop twice as much or $2 \times 1° = 2°$.

With this in mind it is easily seen that if an 8-in. duct requires a velocity of 918 f. p. m. for 1° drop it will require $918 \times 5/3$ for 3/5° drop or 1530 f. p. m.; similarly $918 \times 1/2$ for 2° drop or 459 f. p. m.

temperature it is usually nearly enough correct to average the temperature of the air entering the duct and the temperature at the point of leaving.

EXAMPLE OF USE OF CHART.

For instance, suppose a duct system with 40-ft of 28-in. pipe at 2000 f. p. m. velocity, 100 ft. of 18-in. run at 1400 ft.

Size of Duct. Inches Diam.		Velocity. Ft. per. Min.		Loss per 100 ft. B. T. U.		Length/100		Loss for Lengths Used B. T. U.
28	@	2000	=	0.015	×	40/100	=	0.006
18	@	1400	=	0.031	×	100/100	=	0.031
12	@	800	=	0.08	×	60/100	=	0.048
8	@	400	=	2.3	×	22/100	=	0.506
Total for 1° average temperature difference								0.591

The curves plotted in Fig. 1 are graphic representatives of the calculations figured on this theory and are for 1° average temperature difference between the air inside and the air outside the duct.

The mean duct temperature in degrees F., less the building temperature in degrees F., gives the average temperature difference; for the mean duct

velocity, 60 ft of 12-in. run at 800 velocity and 22 ft. of 8-in. run at 400 ft. velocity. What is the temperature drop if the duct air averages 130° and the building 60°? By Fig. 1 is obtained the losses per 100 ft. of run or

Temperature difference = 130 — 60 = 70°

Then $.591 \times 70 = 41.37°$ temperature drop under these conditions.

NOTES ON THE OPERATION OF CONDENSATION METERS

BY F. A. TUCKER.

Heating Engineer, Dansville (Ill.) Street Railway and Light Company.

Public utility regulatory bodies generally have recognized that the most equitable method of charging for electric, gas or steam heating service is by meter. Practically all modern central steam heating utilities have adopted a meter system of charging, made possible by the development, to a commercially satisfactory point, of the condensation meter. The condensation meter of today is a reasonably accurate and reliable instrument, and yet under certain sets of conditions, may prove a most unsatisfactory one. It is proposed in this article to discuss some of the problems in meter maintenance and operation encountered by central heating utilities.

EFFECT OF DIRT ON METER.

Of all the troubles to which the condensation meter is heir, the greatest is dirt. The effect of dirt in a meter is almost invariably to cause a slowing down or complete stoppage of registration. The dirt is in general derived from two sources; (1) from the customer's heating system, or (2) from the sanitary sewer connection if the meter outlet is connected to a sanitary sewer.

The dirt from the heating system is composed largely of iron rust or

oxide (sometimes of radiator core sand), and this dirt may in some cases be coagulated into a more or less gummy mass by oil or grease. This sort of dirt can be prevented from reaching the meter by the insertion of a suitably designed screen in the meter inlet, but if present in large amounts, the insertion of a screen is not eliminating the trouble but merely passing it on to another piece of apparatus. If the screen becomes plugged up often enough to be a serious annoyance other measures must be taken. In case the dirt is found to be core sand, thorough cleaning of all pipes and radiators is in order. If it consists of iron rust it comes from the unduly rapid rusting away of the pipes of the heating system. This rapid rusting may be due to the use of an inferior quality of pipe or it may be due to a peculiar corrosive property of the condensation itself. In one case known to the writer, the excessive corrosion was thought to be caused by large amounts of carbonic acid gas in the boiler-feed water; a diagnosis found to be correct by the fact that the trouble entirely disappeared after the installation of a "lime and soda ash" feed-water treating plant.

GREASE SEPARATORS A HELP.

In case a large amount of grease is present in the dirt it is probably due to the carrying into the system of cylinder oil or possibly boiler compound from the boilers if a "live" steam system. In either case the remedy is the installation and proper maintenance of adequate separators at the point where the grease enters.

The second place for dirt to enter the meter is through the meter outlet, particularly if this outlet is connected to a sanitary sewer, as is the common practice. The sewer may become stopped up at some point beyond the meter connection. The sewage from the building will, in this case, back up into the meter, and after the sewer is cleaned will leave enough refuse in the meter to prevent its operating. A similar effect will result if the meter should be connected to a low spot in the sewer or where the sewer has little or no fall away from the meter. The opening into the sewer should be made on the top of the soil pipe, never on the side, unless the pipe is vertical. Low places or places with little fall should be avoided. In other words the remedy for this trouble is extreme care in installation.

In repeatedly bad sewers it is sometimes of help to insert a horizontal swing check valve in the meter outlet just at the point of entrance to the sewer. When the sewer backs up, the check valve closes. Of course, the meter promptly fills with water of condesation and stops operating. But no dirt from the sewer gets into it, so that when conditions return to normal it starts right off operating without delay. In general, it may be said that if it is feasible to discharge the meter to any other place than a sanitary sewer it is by all means best to do so.

TROUBLE CAUSED BY "BLOWING" OF STEAM TRAPS.

Perhaps the second greatest cause of trouble in condensation meters is the "blowing" of steam traps, by which is meant the passing of steam, as well as condensation, to the meter. The effect of this, in some cases, is over-registration, but in general will more often be under-registration or complete stoppage. There is, of course, a direct steam loss in addition to the loss due to the failure of the meter. The remedy is obvious—have the steam trap put in order.

METER BEARINGS MUST BE KEPT LUBRICATED.

A third cause of under-registration and stoppage is poorly lubricated bearings. This cause is ordinarily not very troublesome but nevertheless is sufficiently important to warrant regular inspection and oiling of the bearings.

Troubles which cause over-registration are rather few and far between in spite of the suspicion of the average consumer to the con-

trary. If the condensation is not carried away from a "dumping" type meter rapidly enough, and the meter in consequence has an excess of water in it, over-registration may occur. If by any chance condensation from the street mains enters the consumer's heating system, the meter will, of course, measure this condensation and can be said to over-register in the sense that it registers condensation for which the consumer should not pay. The detection of service condensation is very often difficult and requires rather elaborate tests.

In general it may be said that if from a study of local conditions, profile of mains and services, etc. there is found to be ground for a reasonable suspicion of the entrance of service condensation, it is advisable to install a trap and separator in the service pipe.

FREQUENT INSPECTION AND TESTING NECESSARY.

If all the foregoing precautions are observed, it will be found that the number of cases of meter trouble will have greatly decreased. However in spite of efforts, "dead" meters and meters otherwise out of order will continue to occur with rather discouraging regularity. The condensation meter cannot be left to itself for months at a time, as are gas and electric meters. This fact should be recognized at once and the difficulty met by the organization of a thorough and efficient system of inspecting and testing. During the heating season the meters should be inspected at least once every two weeks, and, on important buildings, once a week. It is good practice to record the meter reading at the time of inspection and to compare the steam consumption from week to week. Cases of meter trouble will often be caught in this way that the inspector himself has missed. At sometime during the year it is advisable to bring every meter to the shop, give it a thorough cleaning and overhauling and test it for accuracy.

Lastly, on all work in connection with condensation meters it is especially necessary to employ men of skill and intelligence. Many of the troubles listed above require considerable experience and perseverance to remedy. At the time of the annual shop test the meters are usually completely dismantled and must be reassembled with care to insure satisfactory service. And, perhaps most important of all, these men will come in frequent contact with the public. Unless they know their business thoroughly, they can easily convert the most satisfied and fairminded consumer into a dissatisfied and suspicious one.

THE SIPHON AND ITS RELATION TO HEATING WORK

How this Principle is Applied in Such Devices as Steam Gauges, Cocks, Manometers, Draft Gauges, Loop Seals and Oil Separators.

BY T. W. REYNOLDS.

One of the many things with which the heating engineer must be familiar, is the siphon and its action. It is perhaps more generally known under various other names, such as loop seal, siphon loop, siphon drip or siphon trap. As applied to a steam gauge it is nothing more or less than a U or loop-shaped tube sometimes called a goose neck, pig tail or coil pipe siphon.

A siphon consists primarily of a bent tube or pipe with legs of unequal length, and is more commonly used, as in water supply, for transferring over an elevation between the two liquids from a high to a lower point points. Theoretically, this elevation or distance to which water can be lifted is 33.8 ft., but practically the friction of pipe and fittings, makes it impossible to raise water more than 25 to 28 ft. From this it will be seen that the short leg of the siphon is theoretically limited to 34 ft., since the atmosphere will not support a column of water of greater height.

SIPHONIC ACTION.

The action of a siphon illustrates the effect of atmospheric pressure. This may be more readily understood by reference to Fig. 1, wherein the pressure of the atmosphere upon the surfaces of the water in the two vessels is equal and tends to force the water up tube A B and tube C B. If the siphon or bent tube be filled with water, the atmospheric pressure is opposed in each instance by the pressure of the water in the leg of the siphon which is dipped in the water upon which the pressure is exerted. The longer column of water will resist the atmospheric pressure to a greater extent than will the weight of the shorter column; therefore the pressure upon the shorter leg is greater than upon the longer, the excess of pressure producing motion. The action, then, is on the principle of the hydrostatic balance, the pressure of liquid in one leg always tending to balance the other, and is due to the difference in weight of the liquid in the two unequal legs. A vacuum being formed in the long leg by exhausting the air or by some other means as described later, atmospheric pressure acting upon the surface of the liquid, forces it up through

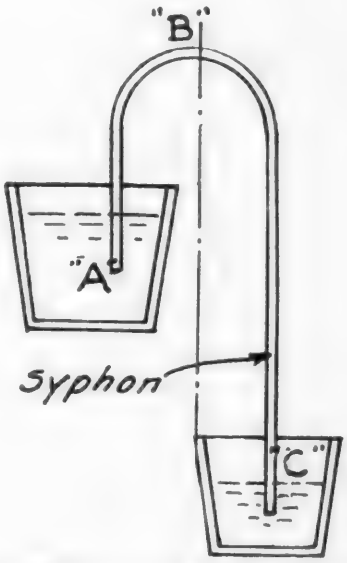


FIG. 1—PRINCIPLE OF SIPHONIC ACTION.

the short leg and into the long leg. This continues unless broken by other means, until the surface of the liquid lowers to a point below the inlet of the short leg. From the preceding explanation, it will be seen that a siphon cannot be reversed in action, that is, a liquid cannot be siphoned from a lower to a higher point. When both legs are full, the long leg is heavier and cannot be drawn over by the weight or suction of the shorter leg. Suction which causes siphonage will act always down the long leg, never up.

THE COIL-PIPE SIPHON FOR STEAM GAUGES

The principle of siphon having been explained, let us first take up its common application to a pressure steam gauge. In the interest of accuracy, the Bourdon tube springs within a gauge

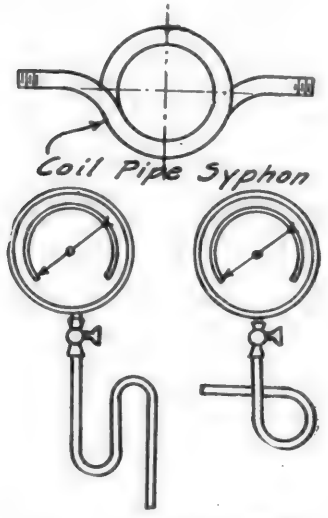


FIG. 2—COIL PIPE SIPHON.

must be kept reasonably cool in use. Consequently it is the custom of gauge manufacturers to warrant only such gauges as are connected with a siphon, stipulating further that the latter must be filled with water before connecting to gauge since the internal heating of the tube springs can always be avoided by allowing water only and not steam to enter them. The coil pipe siphon (Fig. 2) is the best form of a siphon having the largest capacity and this is important for the water should be sufficient to fill the tubes of the gauge which it is intended to protect. It should keep them always full and not permit them to be drained upon cooling down. The external heating of the gauge should also be prevented for if the atmosphere about the gauge is intensely heated, it is soon transmitted to the gauge itself by conduction or otherwise, this may be avoided in part by wooden blocks which should always intervene between the instrument and the frame to which it is attached.

While upon the subject of gauges it is well to note that those used for water, gas or air pressure, do not require a siphon, though they have other important features. In the case of a hydraulic gauge, a hydraulic check-valve is indispensable, since it prevents the gauge from being damaged by the sudden introduction or release of pressure to which it may be subjected, and, with chemical gauges, it is customary to interpose between the tube of the gauge and the corrosive chemical liquid or gas under pressure some material or substance which is not affected by it.

THE PATENTED SIPHON COCK.

The device for chemical protection as just referred to closely resembles the siphon or siphon cock (Fig. 3), the latter being but an assembly of a siphon and a cock. Irrespective of a siphon every gauge should have a stop cock to obviate the oscillation or whipping of the hand while the gauge is under pressure, the cock connected to the gauge being partially closed until the hand ceases to vibrate, with care taken in closing not to diminish the pressure on the gauge. The cock is also required

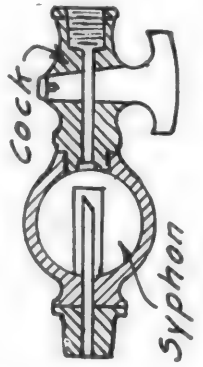


FIG. 3—SIPHON COCK.

for shutting off the line when the gauge is to be repaired. Referring to the sectional cut of the siphon cock (Fig. 3), this shows a loose cap over the pipe which extends into the chamber for the purpose of deflecting the entering steam. The latter condenses in the chamber, stopping live steam from reaching the spring of the gauge. As pressure is removed, the cap over

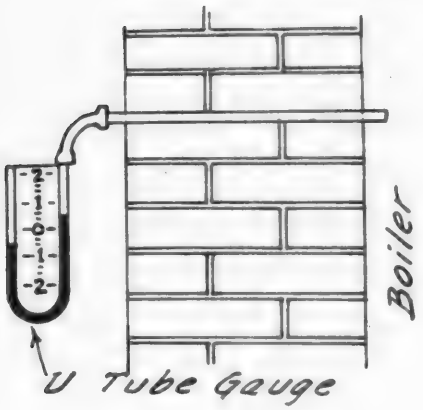


FIG. 4—SIPHON GAUGE.

the pipe falls, making a siphon which empties the water from the chamber, thus preventing danger of bursting from the action of frost.

THE SIPHON GAUGE OR U-TUBE.

Another application of the siphon in the siphon gauge, also called a U-tube or manometer. It is formed of a bent or simple U-shaped tube (Fig. 4) in which the pressure is shown by the difference in level between the fluid in either leg. The principle is that of the hydrostatic balance, as before described, both ends of the tube being open. Various liquids are used, though water is the customary fluid for measuring air pressures.

ELLISON INCLINED DRAFT GAUGE.

A modification of the U-tube to obtain greater accuracy is shown by the Ellison draft gauge (Fig. 5) in which one leg is inclined to magnify the reading several times. One gauge as connected shows the difference of pressure existing between the space over the fire in a furnace and the gas passages below the damper in the smoke breeching. The other gauge is connected to show the difference in pressure between the atmosphere to which it is open at one end, and the space over the fire. In

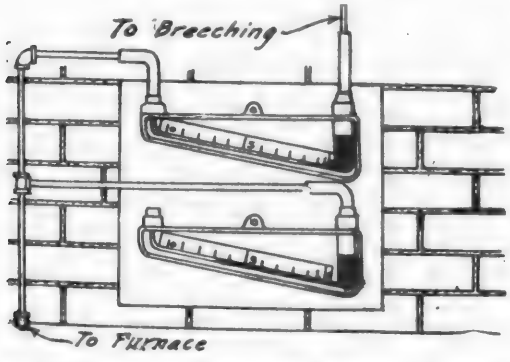


FIG. 5—ELLISON INCLINED DRAFT GAUGE.

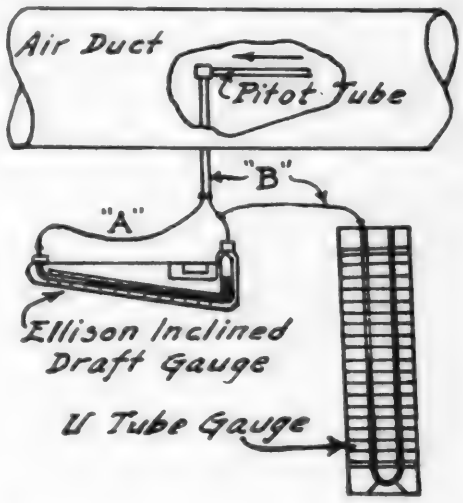


FIG. 6—ARRANGEMENT OF DRAFT AND U-TUBE GAUGES.

Fig. 4 the manometer tube shows the difference in pressure between the outside and the inside of a boiler wall.

DESIRABLE ARRANGEMENT OF DRAFT AND U-TUBE GAUGES.

The pressure exerted by moving air in a duct or pipe may be advantageously measured by a joint arrangement (Fig. 6) of differential draft gauge showing velocity head, and U-tube showing static pressure or pressure head. In this way simultaneous readings may be taken, "A" being connected to the inner tube of the Pitot tube for (pressure head plus velocity head equals) total head, and "B" connected to the outer tube for pressure head only. Since the pressure head is neutralized at each end of the draft gauge, the reading will be the difference or velocity head while the static pressure or pressure head may be read by means of the U-tube connected to "B." Fig. 7 shows the application of U-tubes, so

arranged, reading from left to right, as to indicate the static pressure, velocity pressure and total pressure respectively.

DISADVANTAGES OF SIPHONIC ACTION.

Sometimes the siphon is a source of danger, as shown in Fig. 8. Considering the cold water supply from the street main to the kitchen range boiler as the long leg of the siphon it will be

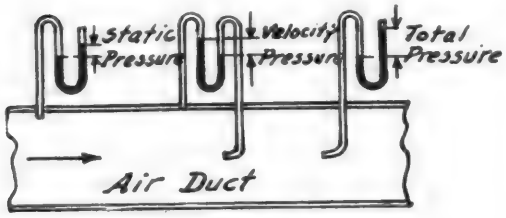


FIG. 7—APPLICATION OF U-TUBES TO INDICATE STATIC PRESSURE, VELOCITY PRESSURE AND TOTAL PRESSURE.

evident that with a break in the city main, the water, if not quickly shut off, might run out of the supply pipe. This would leave a partial vacuum behind, causing siphonage. A further disadvantage of siphonic action is illustrated by Fig. 9 in which the vapor or overflow pipe from the expansion tank of

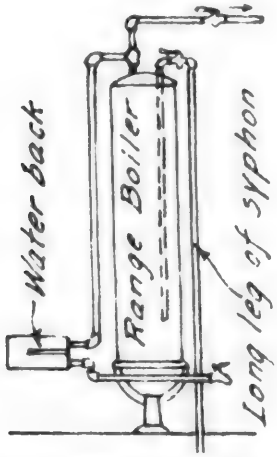


FIG. 8—A CASE WHERE SIPHONIC ACTION IS A CAUSE OF DANGER.

a water heating system is run to the basement and unless vented as shown, would siphon the contents of the heating system.

THE LOOP SEAL IN VACUUM RETURN SYSTEM BETWEEN AIR SEPARATION TANK AND FEED-WATER HEATER.

The pipe connecting the air separating tank in a vacuum return heating system to the feed-water heater should be arranged as a loop seal (Fig. 10) to prevent the exhaust steam in the heater from entering the separating tank and escaping to atmosphere by way of the vent pipe from this tank. If the loop were 4 ft. in depth it would contain about 8 ft. of water which would have to be lifted by the pressure of the steam before it could escape, or (8 ft. $\times$ 0.434 lb.) = 3.47 lbs. steam pressure would lift the water seal. This tank receives all of the air from the heating system and may air bind at the point "A" un-

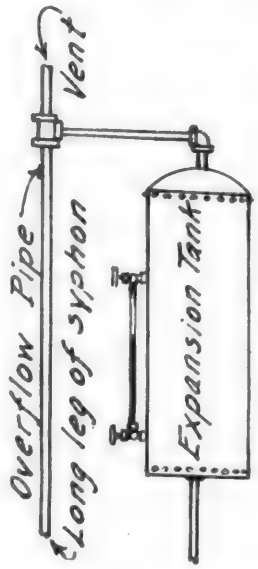


FIG. 9—ANOTHER DISADVANTAGE OF SIPHONIC ACTION.

less the small pipe shown in dotted lines is installed to relieve the air lock. Air cannot readily be forced downward, in particular if the resistance of the pipe and fittings is considerable and head but slightly greater than the back pressure in the heater.

LOOP SEALS FOR THE HEATING SYSTEM.

Loop seals may be used for various purposes, such as dripping the ends of low-pressure steam heating mains (Fig.

11). They are also an advantage when the system is started up. As steam is turned on and enters the cold mains and branches, it condenses readily and this first water of condensation is then quickly passed through the large areas afforded by the loop seals. In the event of stoppage, the loop seal (Fig. 12) may be by-passed by opening the valve in the crossover above. The seal

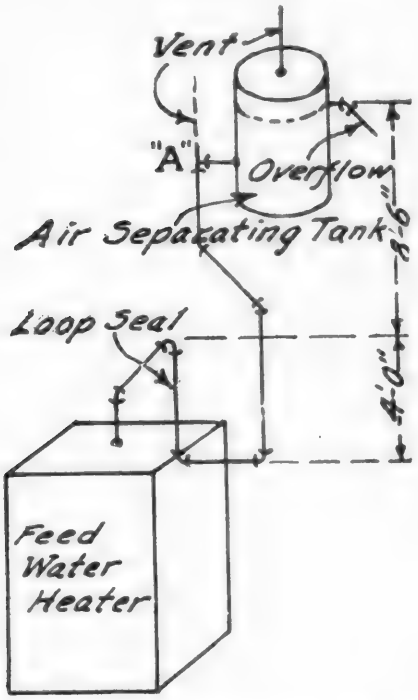


FIG. 10—LOOP SEAL CONNECTING AIR SEPARATING TANK AND FEED WATER HEATER

should be made of 1-in. or 1-1/2-in. pipe, at least 4 ft. in depth, with a clean-out opening closed by a nipple and cap at the bottom.

DRAINAGE OF OIL SEPARATORS IN THE EXHAUST STEAM HEATING SYSTEM.

Oil separators often become inoperative unless proper provision is made for their drainage, the oil freely passing back into the system, in particular with a vacuum. Fig. 13 shows a typical siphon trap which is much used in draining low-pressure systems, as, for example, the oil separator in an exhaust steam heating system. It consists of two legs which may be close to-

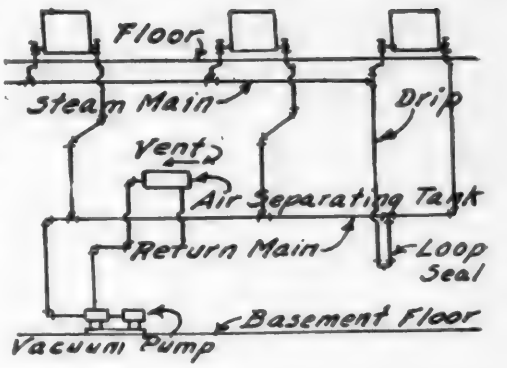


FIG. 11—ADDITIONAL USES OF LOOP SEALS.

gether or far apart. Their lengths, however, must be great enough to prevent pressure acting through one pipe from forcing the water out of the other. The vent pipe extends to the atmosphere to prevent siphoning, since the admission of air to the crown of the siphon destroys its action, atmospheric pressure being then balanced on both sides of the legs. Water 1 ft. in height exerts a pressure of 0.434 lbs. per square inch so that $1 \div 0.434 = 2.3$. ft. of vertical space which must be provided in the siphon trap for each pound

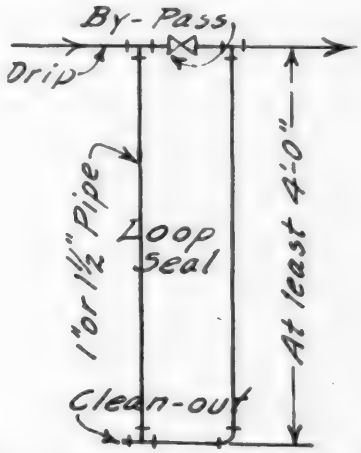


FIG. 12—HOW A LOOP SEAL MAY BE BY-PASSED.

pressure per square inch of pressure in the pipe. To operate properly, the steam pressure plus the static pressure of the water in the one leg must be equal to the static pressure in the other leg. The maximum pressure under which the trap can work without empty-

ing and wasting steam to the sewer is that corresponding to the height of the leg. However, the amount of head-room as sometimes required may not be obtainable. In this event, a pit of sufficient depth must be dug in the floor or a steam trap used.

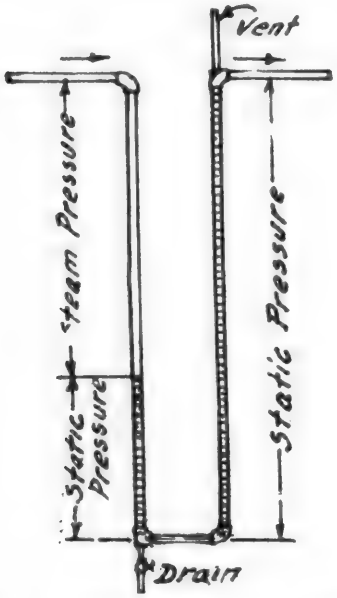


FIG. 13—TYPICAL SIPHON TRAP.

ERRORS IN THE INSTALLATION OF DRIP PIPES FROM OIL SEPARATORS CAUSING IMPROPER DRAINAGE AND RETURN OF OIL TO THE HEATING SYSTEM.

Mistakes in connection with the proper drainage of oil separators are frequent. It is not an uncommon thing to find that oil in the boilers or heating system is directly traceable to improper drainage because of water seals arranged in accordance with a false theory of siphonic action, Figs. 14 and 15 being typical of errors in this respect. The condition assumed is that of a steam heating main which in mild weather, to prevent overheating of the rooms, carries only 5 in. of vacuum, or 2.46 lbs. below atmospheric pressure. In the extreme of cold weather this is reversed to 2.5 lb. gauge pressure. Under conditions of back pressure the depth of seal shown in Fig. 15 is sufficient (6 ft. $\times$ 0.434 lb. $=$ 2.6 lb.) providing the crown of the siphon were vented, which is not the case.

Reversing the process to vacuum (Figs. 14 and 15) oil will be returned to the heating system for the following reason. The oil must all pass over the crown of the siphon, therefore the limiting height for proper discharge will be the distance between the crown of the siphon and the separator, not as erroneously assumed for this typical case, the sum of the distance from the crown of the siphon to the separator and the length of the riser leg of the siphon. This being the case, the arrangement shown in one figure is no better than the other.

A refinement of calculation is that cylinder oil weighs about 0.39 lb. per square inch per foot of column so that for close work the depth of seal should be determined by this rather than for water, although condensate will be caught by the separator also. Therefore, the top of the seal should be $2.46 \div 0.39 = 6.3$ ft. below the separator. Fig. 14 also shows how a change made in the piping as shown dotted would give better oil separation.

AN UNUSUAL CONDITION FOR DRAINAGE AT OIL SEPARATOR.

Fig. 16 illustrates a somewhat similar but peculiar condition in connection with an alternate pressure of 1 lb. above atmosphere and a pressure below 2.46 lb. (5 in. vacuum). Starting with a steam pressure of 1 lb. the oil would stand in the trap from point "A" to "B."

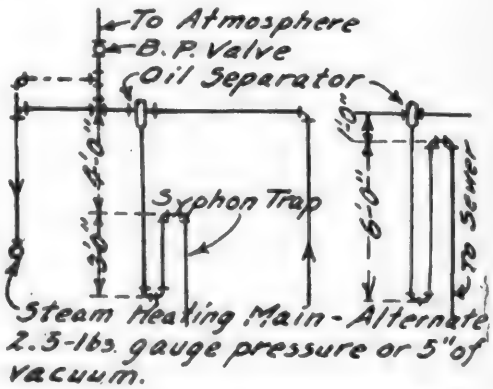


Fig. 14 Fig. 15

INCORRECT ARRANGEMENT OF DRIP PIPES FROM OIL SEPARATORS

But with a reversal of 5 in. of vacuum there would be available only this 2 1/2 ft. of head to resist the pull 2.46 lb. Apparently the remedy is to increase the depth of the seal to 6 ft. but with the case in mind it is assumed that headroom is limited.

Consequently, the discharge side of the seal must be increased in size (See Fig.

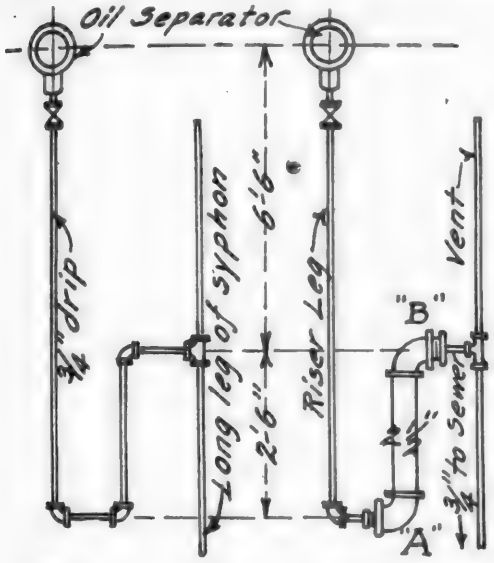


Fig. 16 Fig. 17

REMEDYING AN UNUSUAL CONDITION FOR DRAINAGE AT OIL SEPARATOR.

17) to 2-1/2 in. so as to contain a volume sufficient to supply a 6 ft. head in the riser leg above the crown of the siphon, with an additional 2-1/2 ft. head in both sides of the seal, each balancing the other.

United States Fuel Administration Revived.

In view of the serious coal situation brought about by the strike of miners in the bituminous coal fields November 1 last, it became necessary to revive the United States Fuel Administration. Fuel Administrator Harry A. Garfield re-assumed his duties October 31, one of his first acts being to sign an order reviving the distribution and diversion orders of the Fuel Administration, under which the old list of priorities immediately became effective.

Dr. Garfield has been taking an active part in the latest coal conference, which was called by Secretary of Labor Wilson, and advocated the establishment of a permanent board of arbitration for coal-wage disputes, comprising representatives of operators, miners and the government.

At the sesssion of the coal conference, held November 21, it was announced by Director-General of Railroads Hines that the present soft coal output is 30% of normal.

At the time of going to press, the conference is deadlocked through the inability of the operators and miners to come to terms over wages and working conditions.

Citations for Patriotic Employers.

The War Department, through its Service and Information Branch, is calling the attention of employers to the fact that an official citation is being awarded to those patriotic employers who have re-employed or promised to re-employ all of their former employees who entered the service of the army or navy during the Great War. The citation is in the form of a certificate, signed by the Secretaries of War and Navy. Employers to secure this citation are required to make assurance that they have taken back or will take back on return from service all men formerly in their employ. Letters on this matter should be addressed to Room 1101, Council of National Defense Building, Washington, D. C. Up to October 9 last 38,584 firms, corporations and individuals had been cited.

International Trade Conference

The foundation for an international organization of business men was laid at the recent International Trade Conference in Atlantic City. A name for the new international association will be chosen later. The vital fact brought out at the conference, which was attended by delegates from the leading foreign countries, was that the whole final problem of European rehabilitation and readjustment of world trade involves the extension of credit to Europe to the extent of $2,000,000,000 in a single year. It was further brought out that the people of America have that much capital to lend and that they will be willing to lend it. "The United States will lend," declared one speaker, "and Europe will pay."

THE HEATING AND VENTILATING MAGAZINE

A Monthly Journal of Engineering Progress
Member of the Associated Business Papers Inc.
Member Audit Bureau of Circulations.

Vol. 16 December, 1919 No. 12

Published Monthly at Cooperstown, N. Y. by the
Heating and Ventilating Magazine Co.
Executive and Editorial Offices, 1123 Broadway
New York

A. S. ARMAGNAC ..... *President*
GUSTAVE PETERSEN .... *Secretary and Treasurer*

A. S. ARMAGNAC, Editor
GUSTAVE PETERSEN, Business Manager

European Representative
W. G. HOLLINGWORTH, 304 High Holborn:
London, W. C.

Subscription	$2.00 per year
Canada	2.25 " "
Foreign Countries	2.50 " "
Back numbers	25 cents each

WITH the next number THE HEATING AND VENTILATING MAGAZINE will graduate into its new size of 9 in. x 12 in., which has become the accepted standard for trade and technical journals. The trend of events has long pointed to the enlarged form, which has been most enthusiastically hailed by our advertisers and which would have been adopted long ago if it had not been felt that our readers' interests were paramount in the matter and that they preferred the present size. If the truth must be told, however, the limitations of the smaller page made it necessary in more than one instance to forego the publication of valuable descriptive articles, the illustrations for which could not be reproduced within the present limits. With the steady development in the art of heating and ventilation, necessitating more elaborate designs to handle such features as air conditioning and refrigeration, it finally became apparent that some means would have to be found for properly presenting such designs in our pages. The larger page is the answer, and during the next few months our readers, we believe, will find convincing evidence that the change is fully justified.

The enlargement of the magazine has already had a psychological effect in formulating the plans for the coming year. A broader scope is contemplated with a view of making the pages of the greatest usefulness to all engaged in the industry, from the novice to the most experienced consulting engineer. Already the advertising pages of THE HEATING AND VENTILATING MAGAZINE contain the announcements of manufacturers making every form of apparatus and device used in this field. The efforts of the publishers will be to have the reading pages embrace in a similar way the activities of all branches of the heating industry.

ONE of the notable series of articles that will appear in our columns during the coming year deals with the design and operation of institutional heating and power plants. Those in a position to know are authority for the statement that institutional work will experience a marked growth during the coming year. It is only necessary to recall some of the recent drives for charitable purposes, and to consider those still to come, to realize that a considerable part of the funds thus acquired will go towards providing creature comforts involving the services of the heating and ventilating engineer on a large scale. The first article in the forthcoming series will deal with a proposed standard type of central heating and power plant for public institutions.

WE resume in this issue the publication of weather charts for five representative American cities. This is the fourteenth year of publication of these charts.

FUEL OIL RULES PROMULGATED BY THE NEW YORK CITY BOARD OF STANDARDS AND APPEALS

Rules for burning fuel oil in New York City, compiled especially to meet the present situation, were promulgated by the Board of Standards and Appeals under date of November 6, 1919. They became effective December 1, last.

The code is the result of a number of conferences and hearings at which engineers were prominently represented and while the rules may be characterized as conservative to a degree, yet they are a decided advance on the attitude previously held by the city authorities in practically prohibiting the storage and use of fuel oil.

An important safeguard has been inserted in the rules which will serve to eliminate, at least for the present, the use of fuel oil in small installations, such as private residences. Under Rule 20, on "Operation of Plant," it is provided that "such fuel-oil burning plants may be operated only by a licensed engineer or by a licensed operator who shall be a citizen of the United States, who can read and write the English language, and who is familiar with the practical working of such plant, as evidenced by the certificate of the Fire Commissioner."

Liberal storage privileges are granted by the rules. This point was gained after strong representations had been made in which it was pointed out that the storage of gasoline and even naphtha is now practiced on an extensive scale in the city.

The rules are published under the title of "Rules Governing Construction and Installation of Oil Burning Equipment and Storage and Use of Fuel Oils."

Rule 1 defines the term "oil used for fuel purposes," which is described as any liquid or mobile mixture, substance or compound derived from or including petroleum. The minimum flash point is placed at 175° F. in an open-cup tester. It must not be fed from the tank to the suction pump at a preheat temperature higher than its flash point.

Rule 2 covers the manner of storage. The oil must be stored in metal tanks. When located inside of a building, it must be placed in the cellar or lowest story and at least 2 ft. from any supporting portion of the structure, and, if practicable, must be buried underneath the lowest floor or ground.

Rule 3, on location of tanks in existing buildings, prohibits the storage of fuel oil in frame buildings or in buildings of hazardous occupancy. When not buried the oil tanks must be placed in an enclosure the floor of which shall be at least 3 ft. below the surface of the cellar.

Rule 4, on location of tanks in new buildings, provides that the bottom of the tanks shall be located in or below the floor level of the cellar or lowest story, as shall be determined by the Superintendent of Buildings.

Rule 5, on enclosure of tanks, states that all tanks shall be enclosed in an unpierced wall and floor of masonry or reinforced concrete not less than 12 in. thick. It must be roofed over so as to be capable of sustaining a live load of at least 300 lbs. per square foot. The space within the enclosure surrounding the tank must be at all times vented to the outside air.

Rule 6, covering capacity of tanks, permits capacities of 10,200 gal. in old and new buildings of non-fireproof construction, and 20,000 gal. in fireproof buildings. The tanks must be separated from the rest of the cellar by walls of masonry or reinforced concrete. Openings protected by automatic fireproof doors must have high sills. When tanks are properly buried, the capacity may be increased 100%.

Rule 7, covering service tanks located outside of buildings, specifies a height of not over 15 ft. for such tanks. The distance to the nearest building must not exceed 40 ft. for a 71,400 gal. tank, 30 ft. for a 40,800 gal. tank, 20 ft. for a 30,600 gal. tank, 10 ft. for a 20,400 gal. tank, and 5 ft. for a 10,200 gal. tank. If buried the capacity of the tanks may be increased 100%.

Rule 8, on outside general storage fuel-oil tanks located above ground, requires them to be built of metal, not over 25 ft. high, and surrounded by a dike of masonry or reenforced concrete not less than 4 ft. high. They must be built 10 ft. away from the wall of the tank. The capacity of any single general storage tank shall not exceed 100,000 gal. The gross storage capacity runs from 100,000 gal. when within 75 ft. of adjoining property to 500,000 gal. when the distance is 200 ft.

Rule 9 covers such storage tanks located outside the fire limits where as much as 250,000 gal. may be stored in a single tank. The requirements of Rule 8 apply as to increases in capacity when separated from other buildings. When such distance is over 250 ft., the capacity may be unlimited.

Rule 10, on material and construction of

tanks, specifies the gauges of tanks placed underground, and those placed above ground, both horizontal and vertical. This rule also covers other details of construction.

Rule 11, refers to vent and fill pipes, both of which are to be 2 in. and placed in the top of the tank.

Rule 12, dealing with fuel-oil feed systems, prohibits the use of systems fed by gravity or force systems between tank and pump. Pump suction feed systems only will be approved and anti-siphon system must be provided.

Rule 13, on pumps and piping, prohibits dangerous pressures. The pumps must be located outside of enclosure walls around storage tanks. A separate hand pump must be provided for starting purposes. Oil conveying pipes must be carried above the tank outlet; if laid underground after leaving the tank, they must be carried in a separate trench enclosed in fireproof or non-conducting material. Overflow pipes must be at least one size larger than supply pipes and must be carried back to the receiver terminal. Connections leading to outside tanks must be laid below the frost line and shall not be located near or placed in same trench with piping other than steam lines for heating. Piping under pressure must be designed with a factor of safety of not less than 6 and shall be tested to at least 150 lbs. pressure after installation.

Rule 14, on controlling valves, provides for shut-off valves and gate valves in the discharge and suction pipes near the pump. Provision must be made to insure the cessation of oil supply from tank to burner when the pump is not operating.

Rule 15, on heating, states that all heating to reduce viscosity of fuel oils in any building shall be only by means of hot water coils and the oil must not be heated over 140° F.

Rule 16, dealing with fuel-oil burners, prohibits the use of burners containing chambers which allow dangerous accumulation of gases or containing oil-conveying pipe or parts subject to intense heat or stoppage from carbonization. Oil shall be supplied through orifices not larger than necessary to supply sufficient oil for maximum burning conditions when the controlling valves are wide open. The mechanism shall be so designed that, where manual or automatic control is provided, operated at some distance from the burner, the flame cannot be extinguished except by closing the main shut-off valve in line to burner. Approved gas-pilot lights or equivalent will be acceptable. A check valve must be installed in each oil, steam and air line near the burner. Smoke pipes shall be installed between the burner and chimney and any dampers in smoke pipes must not exceed 80% of the area of the pipe. Necessary regulation of draft shall be accomplished by dampers in the fire or ash-pit doors. Burners shall be installed with overflow attachment so arranged that surplus oil will drain by gravity from the burner into a reservoir. The supply of oil and air or steam shall be interlocked, so that if the steam or oil should fail the oil will be automatically shut off.

Rule 17 deals with fuel-oil fire extinguishing equipment, and provides that every tank of over 10,000 gal. capacity shall be equipped with a system of steam pipes, blanketing gas or other approved system, for use in case of fire. When steam is used, the steam supply pipe shall not be less than 1/2-in., the boilers shall be conveniently located and shall be controlled by valves outside the tank enclosure.

Rule 18, on general devices, provides for suitable indicators, gauges and burners. The thermometers used must have large, clear reading scales, placed in approved thermometer wells with screwed top connections, and must be installed in convenient and prominent positions in the oil supply pipe lines between the service tank and the pumps and also between the pumps and the burners.

Rule 19, provides for the placing of complete instructions near the apparatus.

Rule 20, on operation of the plant, already referred in the opening paragraphs, requires a licensed engineers for operating fuel-oil burning plants.

Rule 21, on installation, makes it necessary to secure the approval of plans for fuel-oil plants by the Fire Commissioner. The plans must be accompanied by the certificate from the Superintendent of Buildings that the proposed construction of the enclosure and the location of the tanks is in accordance with the requirements.

The foregoing rules are put out under the signature of John P. Leo, chairman of the Board of Standards and Appeals, to whom the engineers participating in the formulation of the rules, give full credit for his open-minded and constructive attitude in framing the code.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

NEW YORK CHAPTER DISCUSSES "OIL AS A SUBSTITUTE FUEL"

The idea of using oil as a substitute fuel in New York City this winter in such buildings as schools, apartment buildings and office buildings had already aroused intense interest in the heating trade when it was announced that the topic for the November meeting of the New York Chapter would be "Oil as a Substitute Fuel." This was all that was needed to insure a gathering that taxed the capacity of the Building Trades Club, where the meeting was held November 17.

Vice-president W. L. Fleisher was the special chairman for the meeting and the speakers included S. W. Staley, of the Texas Company, J. P. Leask, of the Gilbert & Parker Co., designers of fuel-burning equipment; and Albert A. Cary, of the heating engineers' society.

Before introducing the speakers, Mr. Fleisher said that the danger of a coal famine and the consequent stampede towards the use of fuel oil placed a peculiar responsibility on the shoulders of heating engineers in bringing home to the public the limitations as well as the advantages of oil as a fuel. We must remember, he said, that the oil supply is limited and that if there was any general substitution of oil for coal, it would require 2,500,000,000 additional barrels of oil to equal the 600,000,000 tons of coal burned each year in the United States.

The chairman then introduced Mr. Staley, who gave an interesting review of the development of fuel-oil burning. The production in 1860 he said, was 500,000 barrels, while to-day the production per year is 450,000,000 barrels. Not only is there an extensive geological distribution of oil, but the discovery of new fields have greatly raised the limit of the available supply.

One of the most attractive features of fuel operation, he said, is that it gives an efficiency of 81%, when burned under boilers operating at 100% overload. The Cunard Line is now changing over its larger boats to make them oil-burning. In addition 75% of the new boats of the United States Shipping Board are oil burners. In fact, Mr. Staley said, the war has been largely responsible for the recent growth in the use of fuel-oil and in waking up people, especially in the East, to its advantages.

The oil that is figuring just now so largely comes from Mexico and is of a quality that does not permit of its being "topped" for gasoline, naphtha, etc. It is this oil that was formerly shipped to Brazil and Argentina but the discoveries of oil fields in those countries has made it largely available for this country and it is now being imported from Mexico in large quantities.

Mr. Staley urged the installation of combination plants which could burn either coal or oil. He spoke of a recent test in New England in which a water rate of 14.5 lbs. was obtained by one pound of oil, having a B. T. U. value of 18,500 per pound.

At the same time, he said, it is easily possible to waste more oil than coal. He said that there were unlimited quantities of oil in Mexico and that the transportation facilities were now greatly improved. He predicted a rapid expansion in the use of fuel-oil for generating steam.

POINTS ON OIL-BURNING INSTALLATIONS.

Mr. Staley was followed by J. P. Leask, of the Gilbert & Parker Company, manufacturers of oil burning devices. Mr. Leask stated frankly that oil-burning installations are expensive in proportion to the horsepower they will carry. They frequently run, in the case of city office buildings, from $10,000 to $15,000 for the equipment alone. Among the advantages are that the oil does not have to be stored near the boiler, it has a higher calorific value than coal, and requires less stack area. While the equipment is expensive it can be put in for less than the cost of coal and ash-handling equipment.

He quoted figures from a Philadelphia test in a hand-fired plant which gave a water rate of 9.37 lbs. from one pound of coal, as compared with 15.9 lbs. from one pound of oil. This made 163 gal. of oil equal 1 ton of coal. The efficiency of the oil-burning equipment was 83%.

Among operating hints, he mentioned that

the oil tank should be at a lower level than the fires to prevent accident in case of leakage. It was good practice to build a concrete rectangular wall around the oil tank.

As to burners, Mr. Leask stated that there were any quantity of different types. He showed one manufactured by his company. The steam-atomizing class of burner, he said, is usually used in stationary plants. The steam requirements for atomization are the principal item. A flat flame is the one most used. For burning the Mexican oils, low-pressure air is used extensively.

To equip boilers for fuel-oil burning, the grates should be removed, as well as the bridge wall. The oil burns in a sharp flame and it should therefore not be allowed to come within 36 in. of the boiler shell. For that reason a large combustion chamber is needed.

Mr. Leask said one of the most interesting features about the use of fuel oil was the ease with which one could change from low to high load. In the average plant, he said, this could be done in less than 10 minutes.

FUEL OIL BURNING AS AN ENGINEERING PROPOSITION.

A. A. Cary, who was then introduced, spoke of the possibilities of fuel-oil burning from the engineer's standpoint. He said the present popularity of oil is a direct product of the war. More oil is now available than ever before. At the same time, the attitude of the coal operators in dealing with consumers has led many to turn hopefully to oil as a substitute fuel. In the Singer Building, he said, some experiments have been going on quietly for some time. This building has four boilers of 400 H. P. each and figures are now available showing a saving of nearly 27% over coal.

Mr. Cary told at length of the efforts that resulted in the promulgation of the recently enacted "fuel-oil" rules for New York City.

It is not generally known, he said, how much gasoline and naphtha is stored in New York, the vapors from which are always dangerous, while oil will not flash at less than 153° F. He told of a case in Cleveland where a 20,000-gal. tank was located next to a burning mill. The building burned to the ground but the oil tanks were left intact. In the recent Standard Oil fire in Long Island City the crude oil tanks were not burned.

Mr. Cary said that conservatism had been shown in the compilation of the rules for New York City, and that as finally drawn up, they had received the approval of the fire insurance people, no higher rate of insurance being required. He said he expected to see many of New York's large buildings, including several hotels, equipped for burning fuel-oil in the near future.

As far as small buildings are concerned, Mr. Cary said it was hardly practicable to burn fuel-oil under the present rules in New York, as they require, among other things, that the apparatus must be in charge of a fireman. Incidentally, he must be an American citizen.

He said it was dangerous to have the tanks at a level above the fire, and that pressure systems are not safe, either. The oil-supply line should be made anti-siphoning.

A written discussion from David Moffat Myers, formerly engineer for the United States Fuel Administration, was presented by Charles A. Fuller. An important point brought out by Mr. Myers was that oil requires a larger storage space that coal, 15 tons of oil, for instance, taking the same space as 25 tons of coal. Another factor to be considered is the uncertain supply of fuel oil. It is also easier to fall down in the effective operation of an oil-burning equipment than when coal is used.

In the matter of relative costs, oil at 4 1/4 cents a gallon is equivalent to coal at $8.50 per ton in evaporative effect. This gives the formula that the price of oil in cents per gallon is equal to one-half the price of coal in dollars per ton. Mr. Myers did not favor the remodeling of existing coal-burning plants for the burning of oil exclusively, as a rule, but that if oil were used it should be as an auxiliary to coal. He held that there was no saving at the existing prices of coal and oil and that what difference there was favored coal.

Walter S. Timmis, president of the heating engineers' society, contributed to the discussion, stating that oil must be bought in large quantities and that in cold weather it is necessary to "thaw" it out by the use of steam coils. He referred to the practice sometimes adopted of superheating the steam used in atomizing the oil, as well as preheating the air. This was taken up later by Mr. Cary who said that superheating the steam would destroy the settings while it is of very little value for heating purposes.

Mr. Timmis said the society should sound a note of warning as to possible legislation restricting the use of oil to marine uses. Long contracts are necessary.

Additional points brought out in the discussion were that oil is delivered in Providence in tanks from which it is pumped to the customer's wells. The burning of oil produces a glaze over the surface of the combustion chamber, protecting the bricks,

COST OF EVAPORATION WITH VARIOUS FUELS.

Fuel	Price per Unit	B. T. U. per Pound.	Efficiency of Boiler and Furnace	Net Evaporation from and at 212 F. per pound or Cu. Ft.	Fuel Cost to Evaporate 1000 Lbs. Steam from and at 212 F.
Bituminous	$4.00 per 2000 lbs.	14,000	Hand-fired 63%	9.10	$0.22
Bituminous	$5.00 per 2000 lbs.	14,000	Hand-fired 63%	9.10	$0.275
Bituminous	$4.00 per 2000 lbs.	14,000	Modern Stoker 73%	10.55	$0.19
Bituminous	$5.00 per 2000 lbs.	14,000	Modern Stoker 73%	10.55	$0.238
Small Anthracite	$2.00 per 2000 lbs.				
Fuel oil	$0.05 per gal. (7½ lb. per gal).	18,500	Oil burners 73%	13.92	$0.478
Fuel oil	$0.04 per gal.	18,500	Oil burners 73%	13.92	$0.382
Fuel oil	$0.03 per gal.	18,500	Oil burners 73%	13.92	$0.287
Fuel oil	$0.03 per gal.	18,500 1000	Oil burners 73%	13.92	$0.191
Natural gas	$0.30 per 1000 cu. ft.	B. T. U. per cu. ft.	Gas burners 73%	0.753 per cu. ft.	$0.398

NOTE: The fuel oil at 2 cents a gallon is equivalent in fuel cost to coal at $4.00 per ton of 2,000 lbs. used with modern stokers. The fuel oil at 3 cents a gallon is equivalent in fuel cost to coal at $6.00 per ton of 2,000 lbs. used with modern stokers.

FROM POWER PLANT, *by David Moffat Myers.*

while coal produces clinkers and the bricks frequently get broken when the clinkers are removed. Mr. Staley emphasized the point that the flames from an oil burner must not come too near the boiler tubes or they will blister them. Air should be admitted underneath the burners and refractory attachments for the burners are not necessary.

Before adjournment a chapter matter was taken up in the appointment of a committee of five to report on the co-operation of educational institutions for the advancement of heating and ventilating engineering. President West appointed on this committee Messrs. Walter S. Timmis, Frank T. Chapman and Frank K. Chew.

Western New York Chapter Given New Data on Heat Transmission.

Interesting newly-compiled data on heat transmission in building construction was contributed by President L. A. Harding of the Western New York Chapter at its November meeting, held at the Statler Hotel, Buffalo, November 10. Mr. Harding, whose work, in several volumes, on "Mechanical Equipment of Buildings," has made him widely known in engineering circles, presented his data in the form of loose-leaf sheets. Some of the data were condensed from his book but other sheets contained new data based on recent tests and were gotten up especially for the chapter. It is the chapter's purpose to present a few of these sheets at each meeting throughout the season and they will then be available for binding in any standard loose-leaf folder.

President Harding's address was followed by an animated discussion.

The Western New York Chapter reports a membership list of about 50 members and a mailing list of over 80 names. All on the mailing list are interested in the development of the heating industry. A program has been arranged for the entire season, the

CHIMNEY DATA.

The following table for area and height of chimney has been used with success in a large number of heating installations.

Capacity of Boiler. Sq ft Direct Steam Radiation.	Square Flue Inches.	Round Flue Diam Ins.	Height Chimney Above Grate.
Up to 500	9	10	40
500 - 1000	12	13	45
1000 - 1500	12	15	50
1500 - 2500	16	17	60
2500 - 3000	20	22	60
3000 - 3800	20	22	70
3800 - 4200	20	22	75
4200 - 6500	24	26	75
6500 - 8750	24	26	80
8750 - 10000	28	30	80
10000 - 10500	32	34	80
10500 - 13000	32	34	90
13000 - 14000	36	36	90

The equivalent B.H.P rating of above chimneys is; Sq ft rating x .00725

For large installations and for power boilers the draft losses should be estimated and a height of chimney chosen to give an intensity of draft sufficient to balance the sum of the losses. See data following.

Draft Loss Through Fuel Bed (Ins water.)

Fuel.	Rate of combustion lb per Sq ft grate surface per hour.				
	5	10	15	20	25
Anthracite Pea Egg	.06	.16 .07	.30 for 0.6 lb. Comb rate	.45	.65
Bituminous Semi-Bituminous	.05	.10	.18	.26	.35
Penna., Ill., Ala., Ind	.04	.09	.15	.22	.28
Slack	.04	.07	.10	.15	.20
Run of mine	.04	.05	.08	.10	.14
Chain Grate	.05	.12	.15	.23	.31

Loss of draft through boilers operating at normal load

Return Tubular ..... 0.25"
Hot Water Tube ..... 0.35"
C.I. Sectional ..... 0.15"

For 150 % rating add 50% to above losses.

Loss through steel breeching 0.15" per 100 ft. and 0.05" for each right angle turn
Loss through slack approx 0.10" per 100 ft. height

Theoretical Draft Produced by Chimneys per foot of Height.

350° F Temp. flue gas. = .0053" 500° F Temp. flue gas. = .0067"
400° F " " " = .0058" 550° F " " " = .0071"
450° F " " " = .0063" 600° F " " " = .0075"

Use .75 of above values to allow for cooling of the gases

CHIMNEY DATA. (CONTD.)

Area Chimney Required — Sufficient area to pass the gases will be provided by using the following formula.

Inside area at top, Sq ft. $(A) = \frac{.06C}{\sqrt{H}}$

C = Lbs. coal burned per B.H.P and H = Height of chimney above grate in feet.

Assuming 5 lbs coal per B.H.P., $A = \frac{.3\,B.H.P.}{\sqrt{H}}$.

If R. = Sq. ft. rating of steam heating boiler, Then $A = \frac{.0022R.}{\sqrt{H}}$

Breechings for power boilers should be proportioned on a basis of 35 sq.ft. area per 1000 B.H.P.

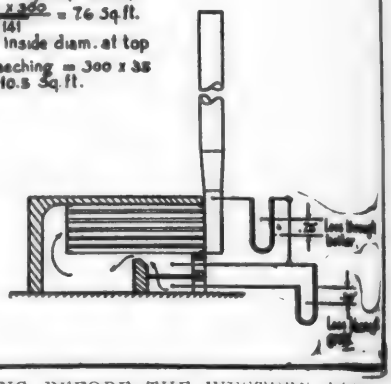
Example:— Required area and height of chimney for an installation of 2-150 B.H.P. return tubular boilers with a chimney of sufficient height to operate boilers at normal rating burning slack, breeching 50 ft. long with one right angle turn Grate area = 60 Sq ft. Rate combin. based on 5 lbs. coal per B.H.P = $\frac{5 \times 300}{60}$ = 25 lbs. per sq.ft.

Solution —

Loss through grate. = 0.20"
" " Boiler. = 0.25"
" " Breeching = 0.075"
One right angle turn. = 0.05"
Slack loss (estimated) = 0.15"
Total = 0.705"

Assume flue temperature of 500°
Draft per ft of height is approx.
.75 x .0067 = .005".
∴ Height of chimney required is,
$\frac{0.705}{.005}$ = 141 ft.

Area of chimney required is,
$A = \frac{0.3 \times 300}{\sqrt{141}}$ = 7.6 Sq.ft.
or 3.1 ft inside diam. at top
Area of breeching = 300 x 35 ÷ 1000 = 10.5 Sq. ft.



TYPICAL DATA SHEETS PRESENTED BY L. A. HARDING BEFORE THE WESTERN NEW YORK HEATING ENGINEERS.

meetings being held on the first Monday of each month. The meeting November 10, at the Hotel Statler, was preceded by a dinner.

The officers of the chapter are: President, L. A. Harding; first vice-president, R. T. Coe; second vice-president, C. A. Booth; treasurer, W. G. Fraser; secretary, C. W. Farrar.

Director John R. Allen of the Heating Research Bureau a Guest of the Minnesota Chapter.

John R. Allen, director of the Bureau of Research of the heating engineers' society, was the guest of honor at the November meeting of the Minnesota Chapter, held at the Elks Club, Minneapolis, November 3. At the conclusion of Professor Allen's address, in which he told of the work planned and already accomplished at the Research Bureau, he was presented on behalf of the chapter, with a gold fountain pen and Eversharp pencil in case, by Vice-president H. J. Meyer. The presentation, Mr. Meyer said, was in appreciation of the chapter's friendship and of the good work that was done by Professor Allen in organizing the Minnesota Chapter.

Fifty-one covers were set at the dinner which preceded the meeting. A collection was taken up to take care of the initiation fees and dues for one year for membership in the Minnesota Joint Engineering Board, which is composed of engineering societies having local chapters in Minneapolis, and also some local engineering societies, the pur-

pose of which is to promote engineering service and good practice in this field.

The Minnesota "Joint Board," as it is called, has come into prominence lately as being a forerunner of the movement which is sweeping the country for co-operation among engineering societies. It is organized specifically for "unity of action and effective service." The affiliated societies that make up the board are:

Northwestern Association of The Members of The American Society of Civil Engineers, Minnesota Section of The American Institute of Electrical Engineers, Minnesota Section of The American Society of Mechanical Engineers, Minnesota Surveyors and Engineers Society, Engineers Club of Northern Minnesota, Engineers Club of Minneapolis, Duluth Engineers Club, and Engineers Society of St. Paul.

The headquarters of the board are at 811 Guardian Life Building, St. Paul.

Pittsburgh Chapter Meets at Bureau of Mines Building.

Forty members and guests attended the opening meeting of the Pittsburgh Chapter which was held October 29, in the Bureau of Mines building, in Pittsburgh. A cafeteria lunch was served at 6 o'clock, and was followed by a reception to Professor John R. Allen, director of the society's Research Bureau.

Professor Allen later addressed the chapter on "What We Don't Know About Heating." He told of the investigations that were being taken up by the Research Bureau which, he said, were already bringing out valuable information that would be made generally available at the earliest moment possible.

At the chapter's business meeting, which followed, all of the former officers were re-elected. The chapter discussed plans for increasing the membership to 100 during the coming year and steps were taken at the meeting for a campaign for new members.

Illinois Chapter Holds Joint Meeting with Western Society of Engineers.

"The Purchase of Coal on Specifications," was the subject of a joint meeting of the Illinois Chapter of heating engineers and the Western Society of Engineers, which brought out an unusually large attendance. The meeting was held at the Engineers' Club, where dinner was served, the members then adjourning to the club rooms of the society on the seventeenth floor of the Monadnock Building.

The topic was presented by John Howatt, president of the chapter and engineer for the Chicago Department of Education. Mr. Howatt spoke from the standpoint of the purchaser. He was followed by Edward H. Taylor, engineer for Crerar, Cinch & Company, who spoke from the standpoint of the coal operator.

Mr. John Howatt favored the purchase of coal on a specification basis, enumerating the advantages of this method. Mr. Taylor, speaking from the viewpoint of the coal operator, stated that buying on specification is not entirely satisfactory on account of the expense of analyzing coal and the difficulty of getting men for this work. He also pointed out that the grade of coal in a mine does not run the same, but varies and the operator is able to give more general satisfaction where reasonable allowances are made and the specifications are not made too rigid.

Why the Draft is More Noticeable on the Discharge Side of a Fan than on its Suction Side.

If you sit in the discharge path of an ordinary electric desk fan, the draft is by far more noticeable than on its suction side. The same is true of your location with respect to a supply or exhaust register of a mechanical ventilation system or again when sitting in front of an open fireplace.

The explanation is shown by the dotted lines in Fig. 1. It is apparent from the sketch that blast currents are projected forward as in the case of a projectile whose momentum carries it forward without change of direction, while exhaust currents envelop the fan only for a limited radial distance from its centre. Dust but a short distance away will not be moved by its suction. It is more difficult to direct

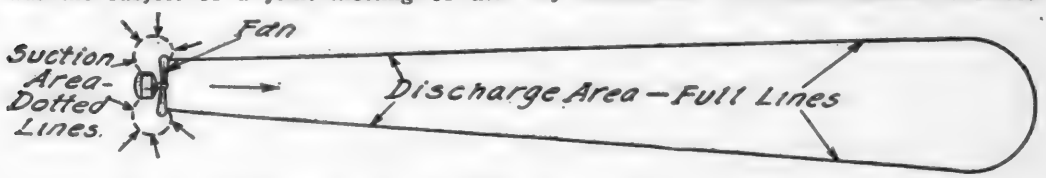


FIG. 1—COURSE OF BLAST AND EXHAUST AIR CURRENTS CAUSED BY FAN.

sexhaust currents than blast currents. This principle is clearly recognized in the removal of dust as in manufacturing processes with the exception of where a suction hood may be so arranged as to completely enclose a machine or its dusty parts. An exhaust current being local in its effect, it is best to supplement it with a dirigble blast, blowing across the dust, forming part of the machine and into the suction of a fan on the opposite side.

The conditions incidental to the air entering from a supply register and leaving through the exhaust register are essentially different. An exhaust opening draws the air from all around without creating a draft in any particular direction. Regardless of the direction the opening may face, the radius with which an appreciable draft is produced toward its opening, is limited. When, however, air enters through a supply register it is under pressure and with a velocity propelling it in a well-defined stream straight forward. It is capable of direction as with the water from a hose. The draft is felt a long distance from the opening.

It is evident from what has been said that fresh air openings should be so placed that the air will not strike any of the occupants of the room. Their number, size and location should be so arranged that either the velocity of volume of the air will not be such as to cause any inconvenience. If vent openings are not too large so that large currents of rapidly-moving air are set up in parts of the room, and are sufficiently distributed, they may be located in closer proximity to the occupants of the room than is possible in the case of the supply openings.

The distance from registers to the occupants should be not more than 25 ft. for supply and 6 ft. for vent registers. There should not be less than one inlet and one outlet to each thirty occupants of a room. The results will be more satisfactory with a greater number of openings and better distribution. The force of the general air movement should not be felt. It should not be in excess of 90 ft. per minute and may be only 10 ft. per minute. Satisfactory velocities in feet per minute through supply registers located on side walls are 100, 200, 250, 300 and 400 to 600 for corresponding heights in feet of under six, six, seven, eight and nine. Likewise for those with ceiling outlet, 60, 90, 120, 150, 200 and 300 for heights of seven, eight, nine, ten, twelve to fifteen and twenty to thirty. The velocity through floor registers may be 100 to 150 ft. per minute and for mushroom openings 150 ft. per minute in the throat. The velocities for exhaust outlets should be for those in or near the floor; 200 if within 4 ft. of an occupant, 300 for a distance of 6 ft. and 400 elsewhere. Ceiling vent outlets may be from 500 and upward, except that higher velocities are not employed for other reasons. Temperature and humidity materially affect our sensibility to drafts. Air will be felt as a draft if introduced at a temperature of more than ten degrees less than the room temperature.

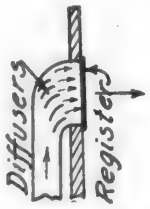
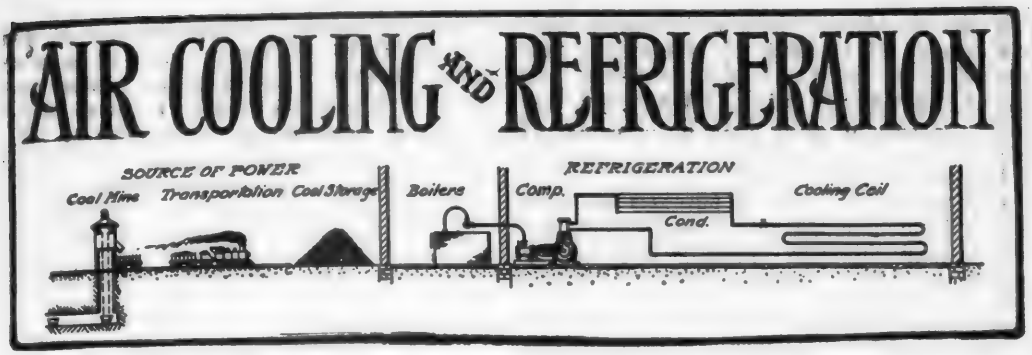


FIG. 2—ARRANGEMENT OF DEFLECTORS TO EQUALIZE AIR CURRENT THROUGH REGISTERS.

It is possible to use slightly higher velocities if the registers are equipped with diffusers or deflectors. There is usually a sharp right angle turn at the top of the rising flue leading to a register which produces unequal velocities over the register face. The air continues up the flue with a momentum as previously touched upon and leaves the top of the register face at a higher velocity than elsewhere, with resulting eddies at the lower part of the register. In this way the entire volume is discharged in a thinner and chilling stream over the occupants. The condition may be remedied as shown in Fig. 2 by the deflectors which when adjusted for equal flow are set permanently in place.

National Conference of Business Paper Editors Formed.

With a view of providing an organization for the discussion and formulation of constructive editorial policies, held in common by the business press, and to provide for a fuller realization of the existing individual and collective responsibility of editors as leaders of thought in the industries they serve, an organization has been formed that is intended to embrace all the trade paper editors in the country. At the organization meeting, held November 13, at the Hotel Astor, New York, the new body was given the title of the "National Conference of Business Paper Editors." The first president of the conference is A. I. Findlay, editor of *Iron Age*, New York.



"CLIMATE DOCTORS" THE LATEST TERM FOR AIR CONDITIONING ENGINEERS

The fame achieved by "the mechanical weather man" of the Carrier Air Conditioning Corporation, of New York, has brought a new conception to many of the functions of the air conditioning engineer. A characterization equally apt is the title of "climate doctor," which has been adopted by the W. L. Fleisher Co., New York, an engineering firm also specializing in this field.

Every material, it is pointed out, is affected by temperature and moisture, which invariably react detrimentally to the finished product, as well as diminishing the efficiency of the worker. Many progressive manufacturers, in varied lines of industry, have recently solved this troublesome problem. Every day in the year has been made an ideal working day. The climate has been made to suit the material and the man.

The right of air conditioning engineers to the title of "climate doctors" is presented at length in an unusually readable booklet recently published by the W. L. Fleisher Company.

A cough drop, the booklet states, is a little thing. But it costs several thousand dollars a day to interrupt the all-year-round production of a big Eastern cough-drop factory. And whenever the east wind blew in summer and the humid atmosphere settled down over that cough-drop factory like a damp blanket, production was interrupted in the packing room.

Cough drops are packed by automatic machinery. The operation makes a certain amount of candy dust. On a hot, humid day this dust became sticky, gumming up the machinery and stopping work. Moreover, such weather conditions caused graining and loss of transparency in hard candy.

A climate doctor was called in for consultation. It is his business to deliver a uniform climate in any place where the fluctuations of Nature's climate make trouble in processes. You show him what you manufacture, and tell him whether you want a warm climate or a cool one, a dry climate or unvarying humidity all the year round. He draws up an exact specification, so many degrees Fahrenheit and so many grains of moisture per cubic foot of air, and by the installation of interesting new mechanical devices he can give you what you want and guarantee delivery.

When the cough-drop factory got its artificial climate, candy dust was as hard as sand and could be picked up by vacuum cleaners when it accumulated round the machines, and the candy itself, once in its cartons, kept its quality indefinitely, there being no difficulty with graining.

INCREASING DEMAND FOR AIR CONDITIONING.

There is a much wider demand for climate in industry than is generally known. The climate doctor has not been on the job very long. Many manufacturers struggling with obscure process troubles do not even suspect that they are due to climate variations, much less know that the climate doctor might be called in to help them.

Some industries make climates of their own which are fairly uniform—but highly objectionable.

At one nickel-plating plant, where cyanogen gas was given off in large quantities, workmen had to wear gas masks constantly. When an air-conditioning system was installed the warm air diluted the gas before it could rise to the workers' waists, and rendered it harmless. Men in that plant have been working without masks for more than a year with no discomfort or poisoning.

STEPS IN AIR CONDITIONING.

The first step in manufacturing a climate is usually to take the natural moisture out

of the air. Even where you want a given percentage of moisture it is easiest to remove from your air the uncertain and varying percentage of natural moisture, and then replace it with just the number of grains of water per cubic foot required. One way of drying air is by heat, but that is expensive, and for most purposes you have to cool the air again. When engineers began to develop this new specialty they quickly adopted another method—that of freezing the moisture out of air by passing it over refrigerating coils.

One of the first applications of this method was in the steel industry, where it was found that fluctuations in the moisture of air in blast furnaces and converters caused costly heat losses, and sometimes variations in the quality of steel. On a humid day about 4 to 5 gals. of water are carried into a modern blast furnace every minute—equal to what will constantly run out of your kitchen faucet.

Freezing did the business, but there was a drawback: Moisture taken out of the air froze to the refrigerator coils; and as ice is an insulator against heat, the refrigerator coils ultimately became so thickly coated that they would not work at all, and the ice had to be removed. Nor was it possible by this system to regulate accurately the temperature of the air or the amount of moisture taken out of it.

DEVELOPMENT OF THE DEHUMIDIFIER.

The latest and best device sounds paradoxical: Moisture is washed out of the air by sprays of water. The contrivance is called a dehumidifier. It is a big boxlike affair with whirling sprays of water through which you blow the air that is the raw material of your artificial climate. The water sprays are made cold by refrigerating pipes in the dehumidifier. They cool the natural air to any temperature required, and also take out most of the moisture. The spray water then flows over refrigerating coils and is cooled again. Because there is a constant flow over the coils the latter have no opportunity to be coated with insulating frost or ice. The air still has some moisture, but this is removed by mechanical means—passing it over baffles and other devices. Should the air require more moisture or a higher temperature, this is supplied by simply reheating it to the required point.

DEFINITE RELATION BETWEEN HUMIDITY AND AIR TEMPERATURE.

There is a definite relation between humidity and the temperature of the air. For example, photographic film requires a drying temperature not higher than 80° F., and a humidity of about four grains of moisture per cubic foot of air. Summer weather runs to 95° temperature and as much as eleven grains of moisture per cubic foot of air—which is far too much! So the summer air is cooled down by sprays of water to 50°, then saturated at that point, or permitted to take up all the moisture it will hold 50°. Then it is reheated to 80°, which gives it about 35° relative humidity. And there is your climate!

PRACTICAL APPLICATIONS.

It is the practical applications that are most interesting. When mother mixes a batch of bread she cannot tell in advance just when it will be ready for the oven, because the rising of a batch of bread is really an agricultural operation. Yeast spores are planted in the favorable soil of the dough, and the rising of their crop depends upon atmospheric conditions, and these vary with the weather. One day the growth will be quick and healthy, and another day slow and poor.

In a great baking establishment, with hundreds of employees working on schedule, weather variations often delay the dough, so that it is not ready upon schedule, and employees and machinery are idle, and even bread deliveries to customers affected. By furnishing a uniform climate for the dough rooms of bakeries, with high humidity and fairly high temperature, it is possible to raise dough on a schedule that standardizes the whole baking process.

The same improvement has been extended to the factories where photographic film, dry plates, and sensitized paper are made. What is good for the gelatin on a movie film is also good for the gelatin in medical capsules, which also had bad habits during hot, moist weather. So the capsule manufacturers bought some climate. Then it was discovered that many drugs kept better in the artificial climate, and so they bought climate for their pharmaceutical storerooms and workrooms—and so the good work went on!

It enables chocolate factories to work all year round, free from heat and humidity troubles, and keeps chocolate drops from turning gray and distilling the oil from their coatings. It facilitates delicate testing work in laboratories and the weighing of things on balances which weigh to the fifth or sixth decimal place.

That sort of balance will indicate the weight of the gum on a postage stamp, but it must be used in an absolutely uniform atmosphere. In cold-storage plants it prevents the drying out of food products, not

only keeping them in better condition, but saving millions of dollars formerly lost by packers who bought steers by the pound, put the meat away in cold storage, and later discovered that it had shrunk in weight through drying in the coolers.

MODERN PRACTICE IN VAPOR HEATING

EDITOR'S NOTE: *For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.*

XVII—THE NEFCO AUTOMATIC VACUUM-VAPOR SYSTEM.

The unique feature of the Nefco system, which distinguishes it from all the others described in this series, is the use of an automatic flushing tank containing water to produce the necessary suction. The important advantage gained by this arrangement is the automatic maintenance of a constant vacuum, so that it is not necessary to get up steam pressure to expel the air from the radiators in order to get vapor into them. In short the system, in this respect, works independently of the boiler.

The open automatic flushing tank used with the Nefco system may be placed in the attic, bathroom or closet, preferably on the second floor. Resting upon and partly within the flush tank is the control tank from the bottom of which a pipe is connected reaching nearly to the bottom of the flush tank. This pipe is fitted with a vertical check valve, as shown in Fig. 2.

From the top of the controller tank a connection is made to the air ejector in the flush pipe. This connection is fitted with a horizontal check valve and tee, as shown, and from this tee a pipe is connected to a vacuum tank in the basement, to which an air line from all the radiators is connected.

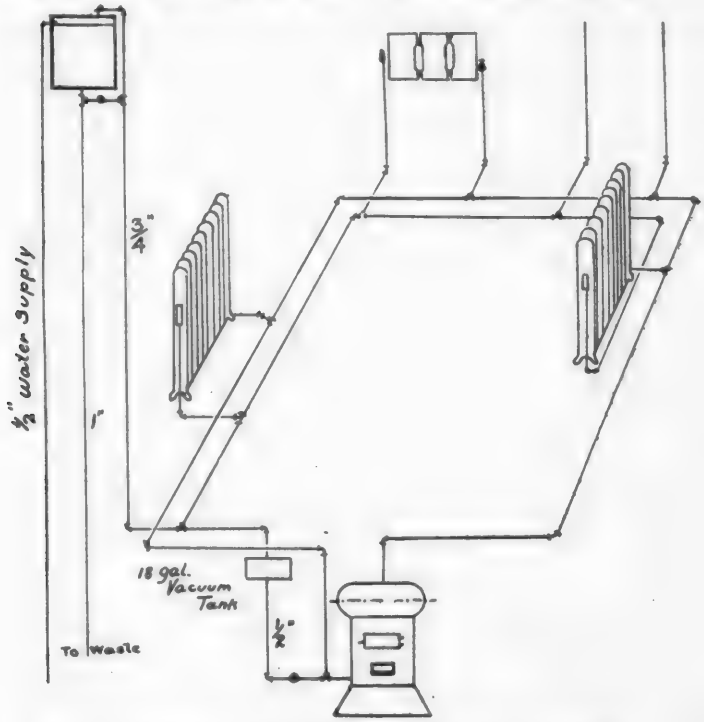


FIG. 1—TYPICAL LAYOUT OF THE NEFCO SYSTEM.

OPERATION OF SYSTEM.

When the tank flushes, the water passing the air ejector in the flush pipe takes air with it from the heating system, and the vacuum thus produced draws water from the flush tank up into the controller tank until the float rises, closing the check valve in the connecting pipe, thus charging the controller tank for the next operation.

When the flush tank is empty and the water stops flowing, the vacuum check valve closes, preventing the air from returning to the heating system, and the flush tank again refills to the proper height, when the ball cock closes off the supply.

There is now a vacuum on the heating system, and water in both the flush and controller tanks. It requires 1 in. of vacuum to hold the water up in the controller, and when it becomes less, the water gradually returns through the pipe at the bottom to the flush tank, raising the level of the water therein and causing it automatically to flush. When the tank flushes, the water passing the air ejector in the flush pipe produces another vacuum on the heating system and draws the water up into the controller again. When the flush tank is empty, it again refills to the proper height, and the apparatus is ready to operate again entirely automatically, as soon as the vacuum on the heating system drops to 1 in., as shown on the gauge. Thus, it will be seen that the design provides for a constant vacuum on the system, automatically maintained, and that it should never be necessary to get up steam pressure to expel the air from the radiators.

FIG. 2—OPEN AUTOMATIC FLUSHING TANK USED WITH NEFCO SYSTEM.

The amount of vacuum produced on the system when the tank flushes depends largely upon how far the water falls and the amount of water used. Tests with a No. 2 apparatus, showed that with the water falling 16 ft. and using from 8 to 10 gal. of water, the gauge showed from 10 to 12 in. of vacuum on 500 sq. ft. of radiation.

It is, of course, well known that some systems are tighter than others. However, with the Nefco apparatus, any leakage in the system is taken care of by the flush tank operating more frequently. With an ordinary plant, however, it should not flush more than five or six times a day.

A No. 4 apparatus, supplying 800 sq. ft. of radiation, flushing about 16 gal. of water under the same conditions as those of the first test mentioned, shows practically the same results.

The flush and controller tanks are of cast-iron. All other parts are metal.

OPERATING AS A LOW-PRESSURE SYSTEM.

The Nefco system, it is pointed out, may be readily run with steam pressure without interfering in any way with its operation under vapor. All air drawn from the heating system is expelled into the waste, thus preventing the possibility of unpleasant odors where the air from radiators is permitted to escape into the room. Another point mentioned for this system is that existing steam systems may be readily converted to Nefco systems.

The manufacturers state frankly that the Nefco system is intended for residential and apartment work and not for the larger

class of buildings. The company, however, is experimenting with the system on a large building and is planning to produce an apparatus of considerably greater capacity than that now used.

Scarcity of Funds for Real Estate Mortgages.

Insurance companies, ordinarily heavy investors in the real estate field, have bought large amounts of Liberty bonds. This, in the opinion of *Commerce Monthly*, the periodical of the National Bank of Commerce of New York, is one of the principal reasons for the scarcity of funds for real estate mortgages for residence and apartment house construction. Individual investors of substantial means, continues the statement, have been disposed to get out of the mortgage market. They have either taken advantage of tax-free obligations or have preferred to invest in high grade stocks and bonds which can be bought to yield well and have an active market. Savings banks have funds available for building, but they are disposed to be conservative and are unwilling to accept, as a rule, a valuation as much over the 1913 level as increased building costs would seem to require. They also operate under a legal limit as to the amount which they can place upon first mortgages. Buildings and loan associations have been called upon heavily for funds, but have not been able to meet the demand upon them and various projects have been under discussion to assist them.

"Nevertheless," it is declared, "the building shortage must be met, and the great prosperity which most individuals and firms have enjoyed during the war should point the way to the main factor in the solution of the problem of finance. Prospective builders should not depend upon the mortgage money market to the extent to which they had been accustomed prior to the war, but should be prepared to invest a greater proportion of their own capital than heretofore, whether they be planning home building or factory construction.

New Compilation of Central Station Heating Rates.

A valuable compilation has been made by the National District Heating Association of the latest revision of heating rates in some cities where district heating systems are in operation. The compilation is published in the October number of the Association's Bulletin. The rates as published make an interesting comparison with those published in the Association's Bulletin in October, 1917, and January, 1918, indicating that most of the companies have "cleaned house" and are doing business upon fairly adequate rates.

An increasing number of companies are adopting the two-rate method of charging.

Plans for Manufacturers' Census.

If present plans are carried out, the forthcoming Decennial Census will include the most complete and comprehensive inventory of the nation's manufacturing establishments ever taken. The schedules which will be used in tabulating the information about the country's industrial resources will be mailed sometime in December. The questions relate to the calendar year 1919. The last manufacturers' census was taken in 1914 when 275,000 manufacturing establishments were listed by the Census Bureau. This time more than 300,000 establishments will receive schedules. In addition, it is expected that 50,000 mines and quarries will also be reported.

Architects Hold Inter-Professional Conference.

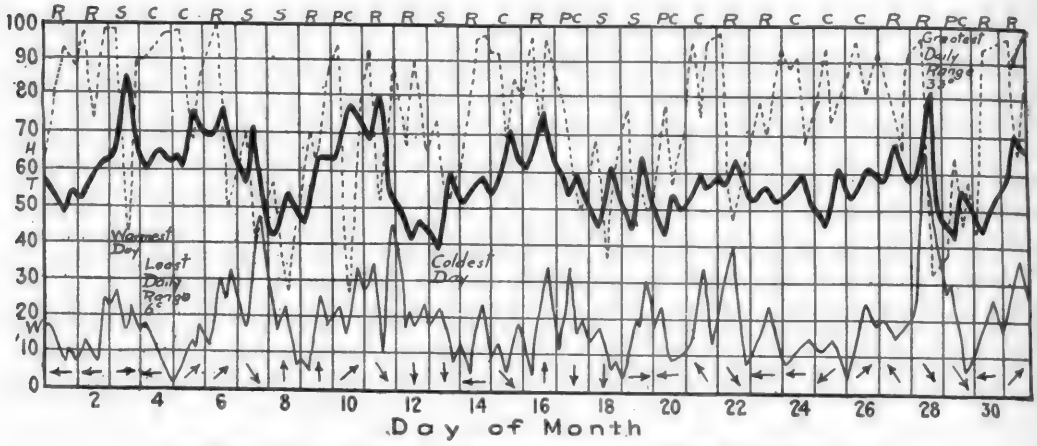
At a meeting of architects, held at the Statler Hotel, Detroit, November 28, and designated as an Inter-Professional Conference, the permanent establishment was considered of a body to be known as the League of Professions. The league is to be oragnized to study the whole question of the professional relation in all its callings with a view of suggesting ways and means of improving it.

Recent Estimate of Building Needs.

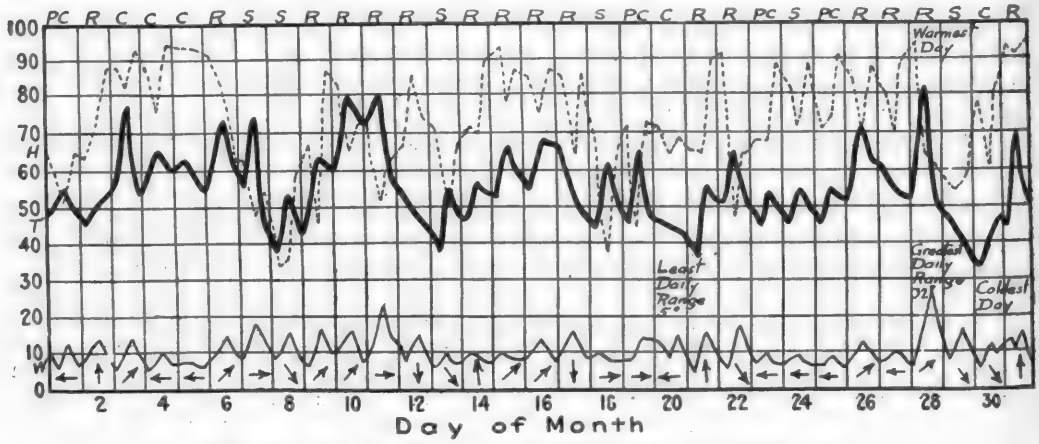
A recent estimate of the building needs of the United States, presented by the New York Sun, includes 1,000,000 homes, 128,000 factories costing $100,000 or over, 325,000 factories costing less than $100,000 each, 6,000 hotels, 5,000 schools and public institutions, 50,000 apartment buildings, 120 major freight terminals, 14,000 railroad stations and freight sheds, and 20,000 churches and theatres.

THE WEATHER FOR OCTOBER, 1919.

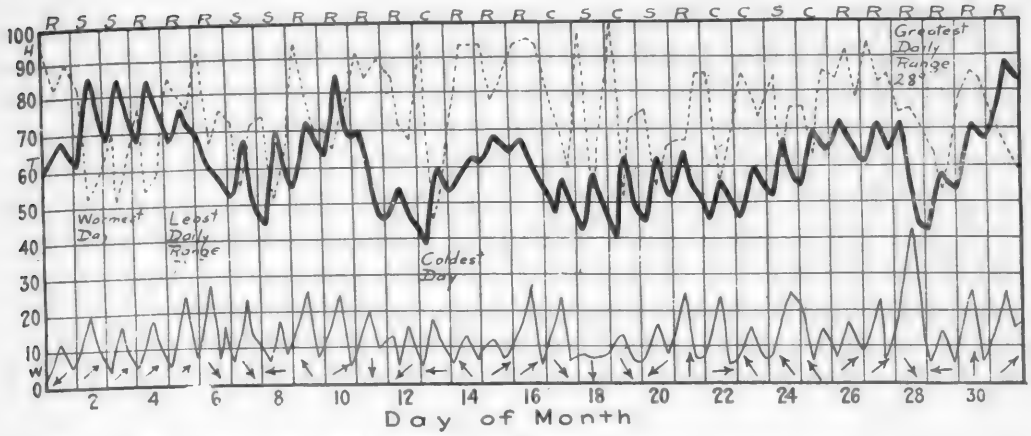
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	85	81	86	85	89
Date of highest temperature	3	28	2	2	1
Lowest temperature, degrees F.	39	33	39	35	39
Date of lowest temperature	13	30	13	29	28
Greatest daily range, degrees F.	33	32	28	29	30
Date of greatest daily range	28	28	28	10	10
Least daily range, degrees F.	6	5	7	3	7
Date of least daily range	4	20	5	19	15
Normal temp. for month, degrees F.	58.4	55	61	57.2	60.8
Normal mean temp. for month, degrees F.	55.6	52.3	54.9	53.2	58.4
Total rainfall, in.	3.17	2.13	5.37	6.41	8.52
Total snowfall, in.	Tr.	None	None	None	None
Normal precipitation, this month, in.	3.71	3.86	2.36	2.55	2.41
Total wind movement, miles.	10706	6264	7005	8867	8864
Average hourly wind velocity, miles.	14.4	8.4	9.4	11.9	11.9
Prevailing direction of wind.	East	S. W.	S. W.	West	South
Number of clear days.	6	5	8	11	6
Number of partly cloudy days.	9	8	1	9	9
Number of cloudy days.	16	18	22	11	16
Number of days on which rain fell.	19	16	18	22	13
Number of days on which snow fell.	—	None	None	None	None
Snow on ground at end of month, in.	None	None	None	None	None



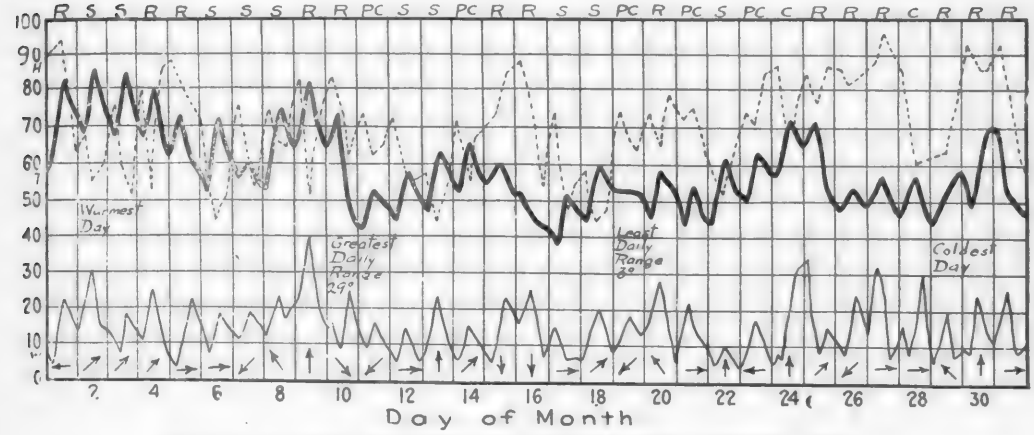
RECORD OF THE WEATHER IN NEW YORK FOR OCTOBER, 1919.
(Hourly Records of the Relative Humidity Plotted on this chart.)



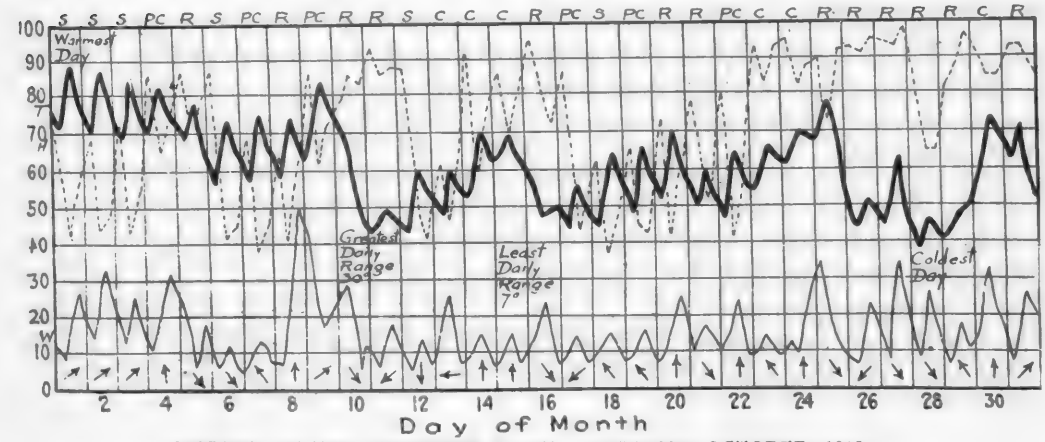
RECORD OF THE WEATHER IN BOSTON FOR OCTOBER, 1919.



RECORD OF THE WEATHER IN PITTSBURGH FOR OCTOBER, 1919.



RECORD OF THE WEATHER IN CHICAGO FOR OCTOBER, 1919.



RECORD OF THE WEATHER IN ST. LOUIS FOR OCTOBER, 1919.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage from readings taken at 8 A. M., 12 M., and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

CORRESPONDENCE

Vento Heater Connections.

EDITOR HEATING AND VENTILATING MAGAZINE:

Referring to the article published in your October issue on connections for Vento heaters, the connections shown are not altogether right and are somewhat misleading as they are adaptable only for Vento heaters when connected with feed and return on the same end, which is not very often done. The "Vento Data Book" shows all these connections very clearly. We would particularly call your attention to the supply connections for double tiering. The proper method is shown in the "Vento" Data Book on pages 47, 48. If connected as is shown in your sketch, there would be danger of short-circuiting. The top tier in Fig. 1 might short-circuit the lower tier and in Fig. 2, the lower tier might short-circuit the upper tier. This possibility is avoided when the connections are made as shown on Pages 44, 47, 48 of the "Vento Data Book."

Chicago, Ill. J. H. D.

On page 44, Fig. 103 of the "Vento Data Book," the method of connections for a gravity system are shown with feed and return connected to opposite ends of the Vento stacks. However, there is a notation on this page which alters the circumstances to a certain extent. This note states that feed and return can be used same end, not above fifteen sections, for a greater number of sections, feed and return must be on opposite ends. In this way the manufacturers' method of covering the situation is similar to that in the article under question wherein it was stated that Vento heaters are often of necessity set in double height and in double width, *since not more than 14 sections wide* should be connected by a single supply or return pipe, and we would add that installations having a greater number of sections are not so common, this being a matter that may usually be avoided by using the proper arrangement or combination of groups, a more feasible method, in fact.

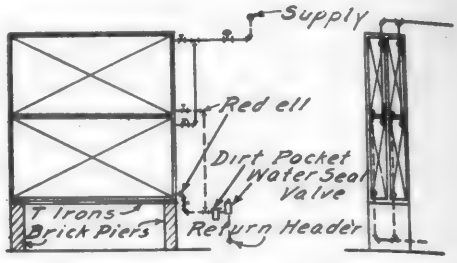


FIG. 1—VENTO HEATER CONNECTIONS CRITICISED BY CORRESPONDENT

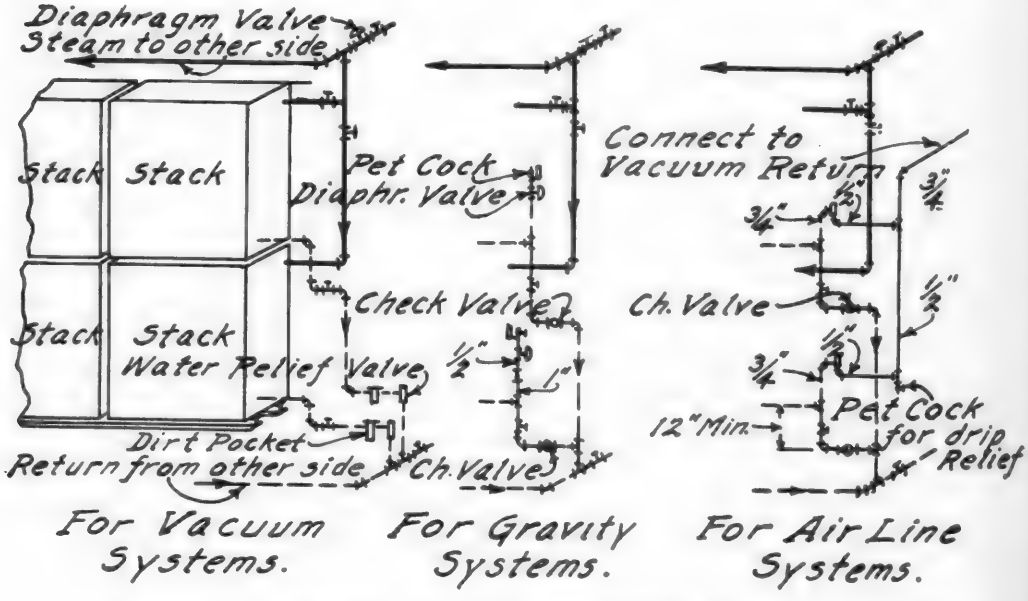
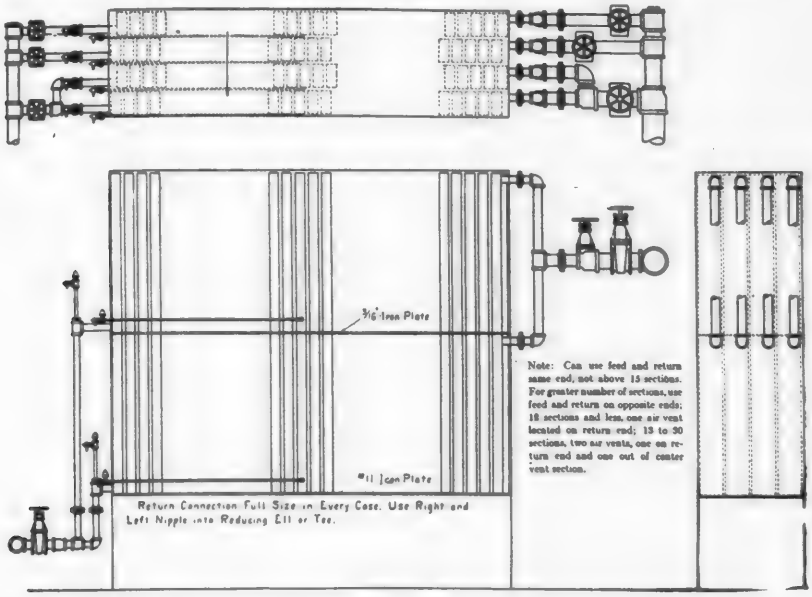
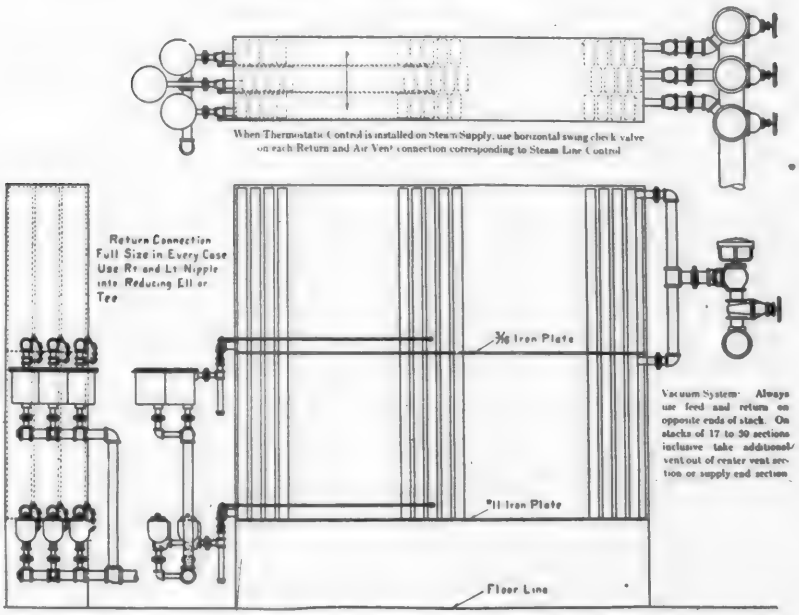


FIG. 2—VENTO HEATER CONNECTIONS CRITICISED BY CORRESPONDENT.

The notation referred to on page 44 does not appear on pages 47 and 48 which show connections for vacuum systems, so it would seem that the sketches tion in this respect for vacuum systems only is not readily apparent. It is also to be noted that their latest edition shows various arrangements in double


3/16" Iron Plate
Note: Can use feed and return same end, not above 15 sections. For greater number of sections, use feed and return on opposite ends; 18 sections and less, one air vent located on return end; 19 to 30 sections, two air vents, one on return end and one out of center vent section.
Return Connection Full Size in Every Case. Use Right and Left Nipple into Reducing Ell or Tee.

VENTO HEATER CONNECTIONS FOR GRAVITY HEATING SYSTEMS.
(From Vento Data Book.)


When Thermostatic Control is installed on Steam Supply, use horizontal swing check valve on each Return and Air Vent connection corresponding to Steam Line Control
Return Connection Full Size in Every Case Use Rt and Lt Nipple into Reducing Ell or Tee
3/16 Iron Plate
Vacuum System: Always use feed and return on opposite ends of stack. On stacks of 17 to 30 sections inclusive take additional vent out of center vent section or supply end section
Floor Line

VENTO HEATER CONNECTIONS FOR VACUUM HEATING SYSTEMS.
(From Vento Data Book.)

in question are in accordance with the "Vento Data Book" with the exception of the two for vacuum systems. Just why the manufacturers make a distinc- height but none in double width as is shown in earlier editions. Consequently, the pages to which the correspondent refers do not cover the case in mind,

which, as shown by the sketches, is one of double height and double width, the connections for opposite end being a duplicate of those shown. This is covered by the notes "Steam to other side" and "Return from other side." If earlier editions of the catalogue govern on this point, then 30 in. must be left at the center of double-width stacks, a requirement of space that cannot always be met.

Referring again to the "Vento Data Book," the two tier installation shown on page 7 and Plate No. 1 on page 10 do not seem to agree with the sketches and text as shown elsewhere in the book, the feed and return connections being on the same end. In particular Plate I shows a heater of twenty sections so connected.

As to short circuiting, this, the writer believes, has prevailed in the past due mainly to air binding of certain Vento sections rather than the method of making connections. Suitably arranged air connections are important, also drips for the most effective and complete drainage. Great stress is laid upon the correct location of the air valve and pet cock. There are many installations which for practicability were connected as shown in the sketches criticised and which nevertheless give excellent results. One instance coming to mind, is that in the Harrison Lamp Works of the National Electric Lamp Association. At least one consulting engineer has for a number of years used this method of making connections to Vento heaters with satisfactory results.

Providing the supply of steam is adequate, pipes sizes correct and air removal from the Vento sections equally efficient throughout, steam will flow as readily to either stack even though one route is through pipe at right angles and not direct as in the other. This is the practice for connections in all other heating work with the exception of water where the motive power for movement is slight and resistances are favorable to a flow in some other direction. On the other hand, the method of connections as shown in the "Vento Data Book," that is the distribution of steam into two equal branches by means of a bull head tee, is usually avoided in heating work.

Efficiency of Direct Radiators in Rooms Ventilated by Exhaust Fans.

EDITOR HEATING AND VENTILATING MAGAZINE:

I would be pleased to know if any experiments have ever been conducted to determine the efficiency of direct radiators in buildings which are highly ventilated by exhaust fans and where the incoming air is not preheated, but is drawn into the building through cracks of doors and windows. This is not an uncommon way of heating and ventilating a building, yet few engineers make any allowances for increased efficiences in such cases.

Direct radiation efficiences have always been determined on the basis of normal conditions; i. e., with the air inside the building almost still, say at about one air change per hour. Now we often have conditions where this amount is greatly exceeded, thereby increasing the air movement in the room and the efficiency of the radiators.

For example: suppose we have a factory room heated by direct radiation and ventilated by a multivane exhaust fan. On ac-

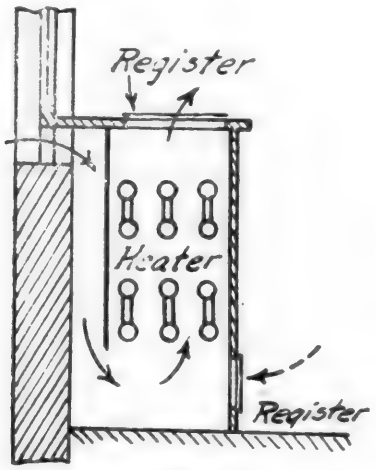


FIG. 1.

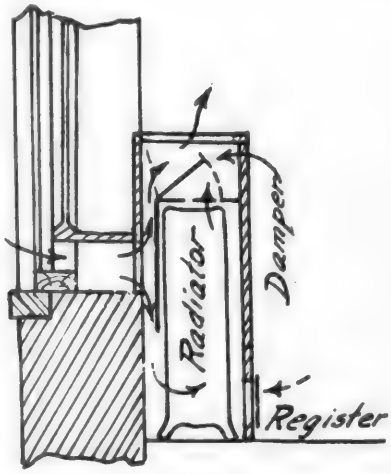


FIG. 2.

TYPES OF INDUCTION RADIATORS, DESIGNED TO DRAW ALL THE AIR OF THE ROOM OVER THE RADIATING SURFACES.

count of fumes in the room eight air changes per hour are required. The windows have adjustable swing sashes and the radiators are located beneath the windows.

Suppose this room has a wall and glass loss of 200,000 B. T. U. per hour when heated to 70° F. in zero weather. The cubic contents of the room is 150,000, therefore the ventilation loss will be

$$\frac{150{,}000 \times 8 \times 70}{55} = 1{,}527{,}000 \text{ B. T. U. per hour.}$$

The total loss will be:

200,000
1,527,000

1,727,000 B. T. U. per hour.

If we assume an efficiency of 240 for the radiators and make no allowance for increased efficiency on account of air movement we would have

$$\frac{1{,}727{,}000}{240} =$$

7200 sq. ft. of radiation for the room.

However, if the radiator efficiency is increased 10% for each air change above normal (one air change) then the efficiency will be increased 70% and the radiation for the room will be only:

$$\frac{1{,}727{,}000}{240 - 168} = 4230 \text{ sq. ft.}$$

which is $7200 - 4230 = 2970$ sq. ft. less, than as first figured, which is a considerable saving.

Now the 10% allowance (per extra air change over one) looks large to those not accustomed to allowing any increase whatever. It may not be exact, but it is not greatly excessive. Moreover the practice of installing too much radiation is not only costly in the beginning, but permits of waste due to overheating, except where the temperatures are automatically controlled.

Washington, D. C.

E. W. S.

The force of air movement in a room should not be such as to be felt, and in no case should it exceed 90 ft. per minute; it may safely be as low as 10 ft. per minute. Entering velocities at register faces may be 300 ft. per minute but in such cases the air is readily diffused throughout the room. Even at that, some occupants of large rooms must be more than 25 ft. from the fresh air openings, otherwise the draft may be annoying. So it will be seen that a movement of air within a room of 60 ft. per minute is about the maximum and this is without doubt present in a room whether ventilated once or eight times per hour. Thus, the general air movement does not compare with that over a radiator, which due to convection currents set up by itself, is about 120 ft. per minute.

The correspondent figures a transmission of 408 B. T. U., an efficiency which is only possible with an air velocity of about 400 ft. per minute when passing directly over the radiating surfaces. By judgment and practical experience, regardless of theory based on assumptions, we know that such an efficiency and velocity is never realized with direct radiation. A speed of 300 ft. per minute has been observed over direct-indirect radiators in which the transmission was 300 B. T. U. per hour, while the velocity through gravity indirect radiators varies from 120 to 300 ft. per minute with a maximum efficiency of about 350 B. T. U.

Of course with central Vento or pipe radiation in a fan system, the transmission may even be 1400 B. T. U., but for this condition the velocity is about 1000 ft. per minute. In all of these cases, the entering air is zero, so that the transmission is in part increased due to the greater difference in temperature.

Of the total heat emitted from a radiator, about 40% is by radiation, an amount which is not increased by greater air movement, so that the correspondent, if correct in his reasoning, should have figured 70% of 60%. The transmission of heat from steam to air is complicated, since the internal and external conduction of the metal has to be considered, also the convection of heat into the air. The transmission varies with surface conditions and the surroundings, also the heat carried away by convection due to flow of air over the radiating surfaces. A hot body is constantly radiating heat into space but at the same time it is cooling by convection. Except when the temperature difference is great, radiation and convection are nearly proportional to this difference. Internal conduction is directly proportional to the temperature difference between the two sides of a body, and inversely as its thickness, while external conduction is about proportional to the temperature difference, except when this is considerable.

In most engineering offices, it is the custom to use coefficients of heat transmission and losses which have been standardized therein from an experience extended over a number of years and which are not changed to suit installations of mechanical ventilation for the reason that irrespective of the number of air changes, no difference has ever been known in the required amount of direct radiation. Had such a difference existed, the manufacture of fans and like appliances would have discovered the advantage and have been the first to point out

the saving in cost of installation. Granting that there is some slight increase in efficiency, the error would be on the safe side and it is even best in any calculation of heat losses to add 10% to the figured radiation as a factor of safety to cover engineering contingencies, as is done with estimates of other kinds.

There is no more reason why the steel or other designer should use a safety factor in his work than the heating and ventilating engineer, since certain factors are unknown, such as the times when fans will be inoperative, additional heat required for short periods of extreme high winds and extreme low outside temperatures below that figured. Further, leakage is the most variable quantity with which the designer of a heating plant has to deal. At the time a heating system is designed, it is to a great extent a gamble on what the final construction of the building will be, and many contemplated helps to heating of a building may later be abandoned to cheapen the cost. Metal sash, weather strips, double windows, etc.; may never finally be installed, however positively they may at first be specified, and too much dependence must not be placed on such aids.

It would seem that were a percentage to be allowed for the increased air movement in ventilated rooms, it would only be consistent to allow a percentage for increase in air movement over exposed surfaces, which would then be added to the total heat losses, somewhat as done in the case of rooms over 12 ft. in height. In the latter case, the heat loss is increased by an amount due to the rise in the mean internal temperature and by the increased rate of air movement over the internal surface of the wall, an increase in percentage which is 2% for each foot of ceiling height over 12 ft.

The correspondent further assumes that the air is diffused throughout the room, that there are no stagnant areas, and that all entering air is by way of the windows directly over the radiating surfaces.

A ventilating system should include an air supply system and an exhaust system. To blow air into an occupied room without an exhaust system gives no assurance as to the source of the air through the room. The air displaced by that introduced must find its way out through windows, doors, etc., but its course is uncontrolled and it may leave the room with but little effect on the quality or condition of the air in the occupied zone. Similarly, to exhaust the air alone without an air supply system gives no assurance as to the source of air coming into the room to replace that exhausted. Some of this takes place directly through the walls while a considerable portion thereof may come in through leaks around the windows and through open doors, causing uncomfortable draughts, particularly to those sitting near the windows and doors. Again, also, the course of air is uncontrolled and there exists no assurance as to a proper ventilation of the occupied space. No system, therefore, may be called a ventilating system unless it provides for a supply of fresh air and exhaust of the heated or vitiated air. An attempt to force air into a room without a suitable exhaust system, or to exhaust air from a room without a suitable supply system will be found to result in failure.

In the minds of many persons there seems to exist a feeling that air may be blown into a room with a resulting plenum or pressure which will force the air out through exhaust flues in connection with which there is no provision made for a positive exhaust of the air by means of fans or accelerating coils. No measurable or effective pressure of this kind can be produced because of the leakage around windows and doors. Therefore, any system which depends upon such pressure for a movement of air out through the exhaust flues will surely result in failure, and usually annoying back draughts or down draughts will result in the exhaust flues.

While not advisable for the reasons previously outlined, still what the correspondent has in mind may be and has been accomplished in part by means of induction heaters as shown in Figs. 1 and 2, in which nearly all of the air due to increased air change is made to pass over the radiating surfaces. The success of this method depends mainly upon the absence of air infiltration at other points as might be obtained by good building construction.

The suction effect of the exhaust fans creates a condition similar to that of indirect radiation except the velocity of the air is usually greater than in gravity work and this gives a slight increase in efficiency. Direct-indirect radiation, as shown in the figures, have an efficiency of about 2 B. T. U. per square foot of surface per hour per degree temperature difference between that of the radiator and the average air temperature. In the case of Vento radiation, the efficiency is still higher.

Example,—using the correspondent's conditions and figures.

$$\frac{\text{200,000 B. T. U. heat loss} \times 55}{\text{150,000 cu. contents} \times \text{8 air changes}} + 70^\circ =$$

79.17° required temperature of air supply to warm the room to 70°.

$$\frac{79.17 \times 1{,}200{,}000}{55} =$$

1,727,346 B. T. U. per hour to raise the air supply from the outside temperature of zero to 79°, that of admission to room.

$$\frac{0+79.17}{2}=39.59°$$ say 40° average air tem.

(212° — 40°) × 2 B. T. U. = 342 B. T. U. per hour efficiency of radiator.

$$\frac{1,727,346}{342}=5050$$ sq. ft. of radiation required.

While the above is in excess of 4320 sq. ft., as figured by the correspondent in his first example, it is due in part to the increased temperature difference, the air entering at zero and nearly all of the air to replace that exhausted by the fans being controlled so as to pass directly over the radiating surfaces. The velocity in this case is doubtless about 300 ft. per minute.

In Fig. 1, the height to which the sash is raised governs the volume of air admitted. An adjustable damper may be placed in the inlet opening or a mixing damper may be used, as in Fig. 2. When ventilation is not required, the sash is lowered and the register in front of the casing near its bottom opened to produce recirculation of air. These heaters should be installed in sufficient numbers to heat so far as possible all of the incoming air and also diffuse it as much as possible.

Heating Factory Buildings with Gas.

EDITOR HEATING AND VENTILATING MAGAZINE:

Will you kindly advise us as to whether it is possible to secure a hot-air furnace of sufficient capacity to heat a three-story factory building, using gas as a fuel?

Brooklyn, N. Y. L. H. C. & Co.

The secret of successful factory heating is to keep the men's feet warm—in other words, to warm the lowest strata of air. Those firms experienced in gas heating, like the Scientific Heater Co., of Cleveland, O., state that they have had their best success by employing radiation, rather than circulation.

To give a practical example: A factory might be equipped, for instance, with warm-air furnaces on the same floor as the space to be heated. An installation of this kind might be a failure. Remove the casing so that radiation would come into play and the installation might be a great success. Where the ceilings are exceptionally high, to heat entirely by air circulation would probably be a failure.

Where gas is used in a coal furnace the same company is authority for the statement that that not more than 50% efficiency can be assumed. Where gas is used in a gas furnace it is not unusual to obtain an efficiency of 80%.

Exceptionally large furnaces should not be used. Two or more heaters distributed so as to keep down the length of pipe is a better arrangement than one extra large furnace.

In figuring capacity of furnace desired, do not overlook the fact that leakage may be exceptionally large. Roof ventilators, fan exhausts, or blower systems may carry away a surprising amount of heat in exhausting the air. Doors may be opened for lengthy periods and the leakage may be far beyond the text-book amount. This is especially the case with steel window sash. On the other hand, forges, heat-treating furnaces, hot water tanks, etc., may add a large amount of heat.

It should also be remembered that the heating system may be closed down over Sunday or over night. In that case, it will pay the owner over and over again to have a heating plant of ample capacity so that the men will work efficiently when the morning whistle blows. A heating plant skimped down in capacity will have to run all night in severe weather because if the factory once becomes chilled, it will take many hours to restore a temperature at which the workers will produce a proper output. An ample-size heating plant very often will heat at half the cost of a just-barely-large-enough plant.

The best practice, where gas is available, is to employ direct radiated heat. It is more economical than circulated heat. Cases are reported where in large factories gas at 30 cents per 1000 cu. ft., so used, was more economical than coal at $3.00 per ton, when burned in a boiler with steam radiation in the factory or with a blower system.

A gas radiator designed especially for factory use has been produced by the Scientific Heater Co., Cleveland, O. A refinement used in connection with this heater, which is furnished in various sizes and types, is a thermo valve which makes each radiator automatic. The thermo valve is placed in the gas line a few feet from the heater and is made without batteries or complicated parts. The dial on the valve can be set for any temperature desired.

Burning Fuel Oil in House-Heating Boilers.

EDITOR HEATING AND VENTILATING MAGAZINE:

I was much interested in the article on the use of fuel oil for house heating boilers that appeared in your September issue and per-

haps you could favor me with further information on the following points:

In private house work the use of a sectional boiler creates fear in the average domestic and a man must call every day to clinker same.

When this is being done a frightful amount of dust and fumes is liberated in what is generally a very small room in the cellar.

If, however, oil was the fuel this would all be eliminated but, as far as your article goes, power is necessary and that is bound to prevent oil being used, as, apart from running cost, you never know when that power may fail you.

Under these circumstances it is much to be preferred to have the whole system capable of acting without any outside aid.

Is there, therefore, any system available whereby any type of existing boiler can be converted to burn oil without the use of power generated elsewhere?

I have in mind something on the order of the primus stove where you can pump up your own pressure to last, say, for a few hours.

Charleton, S. E., England.

E. J. B.

The question raised by our correspondent was referred to the Fess Rotary Oil Burner, Inc., of Boston, and the company states that the objection raised would be difficult to meet. All of its own rotary and turbine burners are absolutely dependent upon electric power and the burners would naturally be out of commission during the failure of a supply of electric current.

"However," states the company, "we cannot believe that their supply is so unreliable as to be shut down frequently enough to interfere with the practically continuous operation of a heating plant. If these shutdowns do occur, they are generally brief and a boiler will hold steam for several hours.

"In the case of direct current, storage batteries could be used but the initial expense would probably make them prohibitive in most cases."

Certain Illinois coals instead of eastern coke can be used for the manufacture of water gas and at a considerably decreased cost, according to experiments that have been made in the city gas plant at Streator, Ill. This means the utilization of nearby coals at water-gas plants in the central States instead of having to depend upon the coke from eastern coals that have to be transported some distance. It will also save the eastern coking coals for other purposes.

The Trade Extension Bureau

Headquarters: Evansville, Ind.

Meeting of Bureau's Board of Directors.

The addition of the word "National" to the title of the Trade Extension Bureau of the heating and plumbing trades was made at the quarterly meeting of the bureau's board of directors in Evansville, October 16 and 17.

Members of the National Trade Extension Bureau will henceforth be known by a small identification mark to be carried in all their advertisements and on their publicity matter, according to the plan of Charles B. Nash.

An interesting feature of the meeting was a chart prepared by Secretary William J. Woolley on which was tabulated the budget upon which the bureau is to operate. The budget for the year's work was approved by the directorate and it was unanimously decided that the treasurer refuse to accept further contributions from associations covering members of an association as a unit. Only individual memberships can now be taken out by individual firms and no longer through an association, except the contractors whose memberships are taken out by the national associations.

Future meetings of the directorate will be held in February, June and October.

Those present at the last meeting were Chairman Frank B. Lasette, who presided, and Joseph Evans, C. V. Kellogg, L. C. Huesmann, Frank Kenney, Charles B. Nash, Ed. Hornbrook, T. B. O'Brien, Joseph Sullivan, D. F. Durkin, James F. Conran and B. O. Tilden.

Our Coming Coal Supremacy.

That the United States will soon become the chief source of coal supply for other nations of the world is the belief expressed in the November issue of Commerce Monthly, the magazine of the National Bank of Commerce in New York.

It is pointed out that this country, although it produces more than half of the world's coal, has in the past left the export trade domination in this commodity to England, whose deposits are but a small percentage of ours. England, however, with production dwindling as a result of the war and her labor unrest, seems inevitably bound to yield place to us.

THE RECONSTRUCTION ERA

Bureau of Housing Favored.

A bill to establish "in the Department of Labor a Bureau of Housing and Living Conditions," which will investigate the housing and living conditions of the industrial population, has received the endorsement of the National Federation of Construction Industries. The bill was introduced in the House of Representatives by George Helden Tinkham, and provides for conducting research work to obtain information that will help in the elimination of slums, the improvement of living conditions, the reduction of the construction cost of dwellings and the financing of extended home-building operations without Federal appropriation. The bill also aims to assist communities during the present housing shortage in making available to the utmost extent all existing housing facilities. It is also intended to establish a clearing house of information on housing and living conditions.

Peace-Time Operation of Council of National Defense.

In a statement recently issued by Grosvenor B. Clarkson, director of the United States Council of National Defense, an outline is given of the peace-time operation of the council, which will continue its work of surveying and classifying the industrial and economic resources of the country for national defense. For this purpose an Interdepartmental Board has been created which includes Van H. Manning, director of the Bureau of Mines and Dr. S. W. Stratton, director of the Bureau of Standards.

Council of National Defense on the High Cost of Living.

After a careful investigation of the high cost of living problem, the United States Council of Defense finds:

That the nation's productive powers have not been fully utilized since the armistice.

That too few goods, notably the necessities of life, have been produced, and that even some of these goods have been withheld from the market, and therefore from the people.

That the high cost of living is due in part to unavoidable war-waste and increase of money and credit.

That there has been and is considerable profiteering, intentional and unintentional.

The Council believes that the remedies for the situation are:

To produce more goods, and to produce them in proportion to the needs of the people.

To stamp out profiteering and stop unnecessary hoarding.

To enforce vigorously present laws and promptly to enact such further laws as are necessary to prevent and punish profiteering and needless hoarding.

To bring about better cooperation and method in distributing and marketing goods.

To keep both producer and consumer fully informed as to what goods are needed and as to what supplies are available, so that production may anticipate the country's demands.

Wooden Houses a Bone of Contention in England.

In connection with the British housing schemes, the proposition of building wooden houses on a wholesale scale is being eagerly discussed, as they are the exception, rather than the rule, in England. It has been proposed that a sample wooden dwelling be imported from British Columbia and set up for public inspection in a London park. This type of house can be constructed in a standardized form and as soon as the design has been approved by the Ministry of Health, they will be imported in large numbers. One firm has received a single order for 500.

It is estimated that it would be possible to sell a five-room standard cottage in England for $1250.00 and that it could be erected and fitted complete for another $500.00. This is about $500.00 below the price of an English wooden

dwelling of the bungalow type with similar accommodations, $1000.00 cheaper than the least expensive concrete cottage, and some $1000.00 cheaper than a brick cottage.

Employers as Well as Workmen Must Share Blame for Present Industrial Situation.

A remarkable report has been issued by the Merchants' Association of New York, in which some frank comments are made on the attitude of employers as well as on the shortcomings of the workmen.

Employers, states the report, which was prepared by the association's Industrial Committee, headed by J. H. Gannon, must take the lead in the effort to apply sound principles to the improvement and advancement of industrial relations.

Three factors are mentioned as retarding the desired evolution of our industrial system: (1) the short-sighted determination too often found on the part of employers and employees selfishly to get maximum results without consideration by either of the interests of the other, or of the public as the controlling motive in industry; (2) lack of understanding and mutual confidence of employers and employees; and (3) the law of supply and demand as the determining factor in fixing wages and conditions of employment.

The committee's recommendations are:

1. The recognition by both employers and employees that the determination to achieve national prosperity, rather to enforce maximum selfish returns, should be the controlling motive in industry.

2. The establishment of a recognized and permanent method of conference between the employer and his employees. On this point the committee holds that conferences at which all subjects of mutual interest are presented are essential to the development of understanding and mutual confidence. There should be a definite arrangement whereby employees can collectively take up disputes or matters of common interest with employers. The committee offered no definite plans, but suggested that whenever plans of conferences are inaugurated they should be worked out jointly, and not prescribed by the employers. The subjects that should come within the scope of such a conference are wages and working conditions, and plant conditions affecting the health and general welfare of the workers.

3. The limitation of the economic law of supply and demand as a basis of labor policy by the utilization of a more human doctrine. On this point the committee recommended immediate recognition of the principles that:

All wage earners, in return for a fair day's work, have a right to a living wage.

Continuity of employment at normal wages should be maintained up to a point where permanent prosperity and stability of the business, rather than immediate profits, would be endangered thereby.

The "Quantity Survey" Plan in Estimating.

Supplementing the arguments presented in THE HEATING AND VENTILATING MAGAZINE for November, in favor of the "Quantity Survey" plan as a solution of the problem of "payment for estimating," the following additional points are made by the same writer, in a report prepared for the Committee on Methods of the Associated General Contractors of America. According to the "Quantity Survey" plan, estimating expense is defined as that involved in determining labor and material prices and everything else that enters into pricing up quantities of work to be done; while quantity expense is that connected with the preparation of quantities. This introduces the question of employing quantity surveyors to prepare quantities and the methods of using such quantities in bidding and in contracting, payment for the quantities, and like questions. With the "quantity survey" system, general surveys are issued together with the drawings and specifications, being guaranteed accurate for bidding purposes.

As to the ability of a surveyor to supply satisfactory quantities, this, it is stated, is being done continually. Acceptable quantities must be accurate and they must be in such form that contractors can apply their customary estimating methods to them without difficulty. When a quantity survey is made it is supplied to bidders, together with the drawings and specifications. Bids are requested for the erection and completion of the building in accordance with these documents.

There are two ways of relieving bidders of any responsibility for the accuracy of the quantities supplied to them. First, the quantities may be made a part of the contract, that is, it will be specified

that any additions to or deductions from the amount of work listed in the quantities will be adjusted in accordance with the specification stipulations governing changes. Second, in making the quantities a part of the contract and providing for adjustments of chance errors from time to time, most architects and building owners prefer to have the contractor selected for contract consideration either accept the quantities as accurate or take whatever time is necessary to check them up before signing the contract.

Quantity preparation, it is argued, is fundamentally clerical work which can be delegated to others. The logical, business-like way to handle that part of a building operation is to have the architect, or owner, present a list of the requirements of a job and to ask a price for doing just that amount of work.

The result of general adoption of the methods outlined, it is claimed, would be that a contractor would ordinarily do quantity work only on the jobs that he won.

Recently a method for handling the charge for a survey has been devised that makes it easy for an architect, without consulting his client, to supply quantities, provided he has the support of the contractors. Briefly, this method is that the company making the survey agrees to equally divide its charge for quantities in any trade among all the bidders to whom they are issued.

OTHER PROPOSED METHODS FOR ESTIMATING.

An eastern contractor has outlined the essential features of a plan that he believes should be considered. While not complete, it contains several interesting features. First, he would have the owner stipulate that the work should not cost over a stated amount. Of this maximum cost, a certain per cent would be set aside for division among the three or four lowest bidders. Sub-contractors would receive no allowance on the ground that they generally submit the same figures to all of the general contractors who they find are bidding. The number of bidders who would be paid for estimating should be decided in advance in accordance with the size of the work.

DISCUSSION OF THE KELLEY PLAN.

In connection with the proposed "Kelley" plan which comprises a definite schedule for charges for estimating the cost of projects valued at from $2,000 to $1,000,000, one point that has been raised is the lack of any provision under the Kelley system for paying the contractor for submitting estimates on jobs that do not go ahead. The practice is by no means infrequent of calling for bids merely for the purpose of seeing what prices will be quoted and in other cases, when a low estimate has been prepared, the bids may be thrown out because they do not come within the estimate. Some means should be provided in any plan to secure payment for estimating whereby these jobs should pay their just share of estimating expense.

Surplus Iron and Steel in Hands of War Department.

The Director of Sales of the War Department announces that the department held as surplus, as of October 16, approximately 402,122 tons of iron and steel, including raw, semi-finished and finished steel; also alloys and iron and steel scrap. All of this surplus is now being offered for sale. Inquiries relative to these surplus stocks should be addressed to the Chairman, Ordnance Salvage Board, Ordnance Department, Munitions Building, Washington, D. C.

"Cost-Plus" Contract with Unusual Features.

An unusual form of "cost-plus" contract which contains a carefully-worked plan for adjustment of the contractor's fee, has been prepared by Gannett, Seelye & Fleming, engineers, of Harrisburg, Pa. The essential features of the plan are the submission of an estimated cost, based on the unit quantities furnished, together with the percentage fee asked by each contractor who bids on the work; preparation of a corrected estimated cost at the completion of the job; a deduction from the contractor's fee in case the actual cost exceeds the corrected estimated cost, or the payment of a bonus, if the former cost is less than the latter. However, the contractor is guaranteed a minimum fee in any case.

The following paragraphs, which are taken from the contract, furnish in detail the agreement as to the contractor's fee:

"In case the amount of work actually done in any of the classes for which unit prices are given above is greater or less than that given in the list of quantities, a corrected estimated cost shall be com-

puted using the contractor's estimated unit prices and actual quantities, to which shall be added the actual cost of all extra work authorized by the engineer and not included above. This sum shall constitute the corrected estimated cost upon which the fee of the contractor shall be based.

"As full compensation for the services of the contractor including profit and all general overhead expenses, except as herein specified, the company shall pay to the contractor in addition to the actual cost of the work as defined above, a sum of money equal to——per cent of the corrected estimated cost.

"It is specifically provided and agreed that in case the actual cost of the work exceeds the corrected estimated cost, the contractor shall be penalized by deductions from his final payment, as follows:

"A penalty of (25%) of the excess cost up to an excess of $10,000, and a penalty of (50%) of all excess above $10,000; but in no case shall the contractor receive a net fee of less than (3%) of the corrected estimated cost, after penalties for excess cost and for time in excess of time agreed upon for completing the work, only, have been deducted from his total fee.

"It is also specifically provided and agreed that in case the actual cost is less than the corrected estimated cost, the contractor shall receive a bonus in addition to his final payment as follows:

"A bonus of (25%) of the saving up to a saving of $10,000, and a bonus of (50%) of all saving above $10,000."

LEGAL DECISIONS

Construction of Heating Plant Installation Contract—Architect's Certificate—Clause as to Completion.

An interesting case has been recently decided by the Wisconsin Supreme Court, Shine v. Hagemeister Realty Co., 172 N. W. 750, involving the construction of a contract for the installation of a heating plant in the defendant's new business building at Green Bay, Wis. The defenses were: (1) that the work had not been fully completed; and (2) that no architect's certificate had been given to the plaintiff as required by the contract before payment was due. Two counterclaims were (1) that, by reason of failure to install the plant within the time limit, first entered the building and heaved up the basement floor, causing $1,500 damage; and (2) that because of delay in installing, the defendant lost the use of the building for two months, to its damage in $950.

The contract, dated August 7, 1916, contained provisions: (1) That the work "was to proceed as fast as the general construction will permit," and to be completed by December 15, 1916; (2) that the sum to be paid the plaintiff therefor was $1,685, "only upon certificates of the architects as follows: 85 per cent of the work done and material furnished upon premises at any time architects issue a certificate; the final payment to be made within 30 days after the completion of the work included within this contract, and all payments shall be due when certificates for the same are issued."

The court held that the result of the action depended upon the injury to the basement floor which formed the basis of the defendant's first counterclaim. If this was not caused by frost no damage was shown to have resulted from the plaintiff's delay. It was held that there was sufficient evidence to sustain the finding made by the jury that it was not caused by frost.

Regarding the objection that no architect's certificate was ever obtained, the rule of law made it the duty of the plaintiff to have the certificate or to show that it had been withheld by the architect fraudulently or arbitrarily or by reason of a substantial mistake as to his powers or duties. In the present case it was held that the architect clearly attempted to pass upon a matter not submitted to him by the contract, namely, the responsibility for injury to the floor. His powers were simply to issue certificates for "work done and materials furnished upon the premises" by the plaintiff. Manifestly that did not include power to determine that the contractors delay caused the cement floor which had been laid by another contractor to heave up. A refusal to award a certificate because of matters entirely outside of the submission is necessarily a mistaken and arbitrary refusal, and amounts in law to a fraudulent refusal, even though made in entire good faith. The architect on the witness stand testified that the breaking of the floor was the only reason why the last certificate was withheld. This was in legal contemplation no reason. The plaintiff's work having been done and materials having been furnished, the certificate was due, and the question whether the plaintiff's delay in installing the ap-

paratus caused the breaking of the floor put in by another contractor was a question to be fought out between the parties after the certificate was given. The architect mistook the scope of his duty, and because of that misapprehension refused the certificate. This made the refusal a mistaken refusal within the meaning of the law and excused the plaintiff from producing the certificate.

Another point noted by the court, though it did not prove to be necessary to the decision of the case, was that the plaintiff's contract was absolute to push the work as fast as "the general construction would permit" not as fast as "the general construction and other attending circumstances" would permit. This being the case it was held that evidence consisting of statements by the plaintiff and other contractors to the effect that steam fitters were scarce at the time; that men and supplies were hard to get; that jobs of this kind were seldom completed on time; and that the work was done as rapidly as such work is customarily done—was all incompetent.

As the case was decided on the point of damage to the floor, the question whether the admission of this evidence was prejudicial to the defendant was immaterial, but it is a point that might well be noted by heating contractors in preparing contracts. Judgment for the plaintiff was affirmed.

Contract Provisions on Letter Heads not Binding.

An important legal point is reported by Elton J. Buckley, writing in the *Warm Air Heating and Sheet Metal Journal* regarding the clause often printed on letter heads to the effect that "all agreements are contingent upon strikes, fire, accidents, or delays beyond our control. All prices are subject to change without notice, and all contracts and orders taken are subject to the approval of the executive office."

In a recent case where a contract was executed by the branch manager of one of the parties to a law suit, he was called off on the ground that the contract had to be approved by the board of directors before it became effective. The directors, when it came up to them, turned down the contract.

The decision of the court was that no small-type provision like that quoted could be considered part of the contract, even though the contract was written, as it was in this case, on the letter head containing the provision in question.

The court ruled that "in view of the manner in which its provision is printed upon the stationery of the plaintiff, it cannot be held, as a matter of law, that it was incorporated in and a part of the proposal. The language of the proposal is clear and explicit, and this provision, which is printed in small type, cannot be assumed to change, alter, or modify it, unless it is part of the proposal. It was not incorporated in the body of the proposal or referred to in it. When an offer, proposal or contract is expressed in clear and explicit terms, matter printed in small type at the top or bottom of the office stationery of the writer, where it is not easily seen, which is not in the body of the instrument or referred to therein, is not necessarily to be considered as a part of such offer, proposal or contract."

The Up-to-date Drafting Room.

Few realize the progress which drafting has made in the last generation. Even in engineering circles the work does not receive proper consideration. Thirty years ago the drafting and construction work went hand-in-hand. In other words, the designing and planning was not nearly so important a function as it is today. Projects now are thought out, designed and planned in every detail and carefully estimated before proceeding with construction. This is why drafting, which is, properly speaking, engineering, has become such a highly developed art, requiring an immense amount of technical knowledge and practical experience.

Drafting is not a trade as it was so considered years ago, because it is not physical labor so much as it is mental. Therefore, drafting is actually a profession, regardless of the fact that practically all draftsmen are employed and not in business for themselves. The profession of drafting should be separated from engineering because it is the engineering profession just as much as is the work of construction. It is unfortunate that the relation of drafting to engineering is not better understood by engineers and draftsmen and the public. It is a great mistake for any one to think that drafting is a menial occupation or is the unimportant part of engineering. Drafting, considered as a whole, is the most important part of engineering, for it is in the preparation of the design and detail drawings that the economy of the whole scheme or structure is determined.

It is the work in the drafting-room that decides the success or failure of most all engineering projects.

In order then to correct the misunderstanding and avoid the existing confusion regarding the draftsman and his work, the word, draftsman, and drafting-room, had better be eliminated. Every one recognizes a designer or capable draftsman as being an engineer, so why not call them engineers? Likewise the drafting-room, the engineering department? As it usually is so styled in most all correspondence. This to me seems the only way to bring order out of chaos and unity of thought and purpose among engineers and draftsmen.

There is considerable discontent in the various drafting-rooms throughout the country which has been brought about partly through this inclination to separate the draftsman from the engineer and partly on account of low salaries of draftsmen as compared to laborers and tradesmen. Certainly it is an unstable condition when the man who posseses the intelligence and ability to design and construct a machine receives a compensation frequently much less than the man who forcibly to their attention. Employers ers are striving to eliminate the causes of unrest among their workmen and this is one which must be considered and remedied or else these men through their various organizations, societies or unions which are now developing, will bring it forcibly to their attention. Employers must do their part to make the work of their employees interesting, and salaries are not the only thing in which draftsmen are interested.

The drafting-room must, first of all, have the very best system of lighting and this should be determined in each particular case by an expert in illumination. Frequently drawings are made which require working to 1/100 in., therefore it is highly important that these men have the very best lights to avoid eye strain.

Good drafting tables should be provided and other accommodations for the men who are doing this very important work. There seems to be a desire all too frequently to economize on the drafting-room equipment, hence so on the alert, with the result that they were found ready to undertake new methods with a fair chance of success. Well, then, let it be called the fault of the education **of the architect, but,** this being agreed, **it would perhaps be as well to point out that it is not very logical to blame the education of the present for the defects** of men educated 20, 30 or 40 years in the past, unless it be taken for granted that no changes in system have occurred during the intervening period, an assumption which I am afraid is very likely to occur, a defect in outlook which is consistent with the primary causes of the failure. What are the defects of our educational system? In the past they have been just those things which with cumulative effect have broken down under the strain of evolution, "blindness and conservatism."—*Robert W. Shellmire in Engineering and Contracting.*

New Fuel for Stubborn Fires.

A Red Cross man, in Rumania, discovered a new kind of fuel recently, when his wits were put to the test of making low-grade lignite burn under his soup kitchens.

Wood and coal have been very scarce in Rumania since the German and Austro-Hungarian invasion and the traveling soup kitchen men, "goulash cannon operators," are sometimes hard put to it, to keep the pot a-boiling. John H. Nolan of Alpena, Mich., Red Cross worker near Buzeu, found some of the rivers thickly encrusted with oil scum. One day a brilliant idea came to him.

Mr. Nolan and some of his assistants skimmed the oil off twenty or thirty square yards of the surface of a stagnant pool near their food station and then dropped the lignite briquettes into the oil. After the briquettes had soaked for two days they were taken out and set afire. The lignite burned with a cheerful roar and now all other goulash experts working for the Red Cross are following the same method.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE ***on receipt of the stated price.***

The Competition of Fuel Oil with Coal. Coal Trade Jl., vol. 50, no. 37, Sept. 10, 1919, pp. 1109-1111. Analyses of threatened competition of fuel oil with coal. 40c.

LIQUID FUEL.

Liquid Fuel for Domestic Purposes, E. Bowden-Smith. Petroleum World, vol. 16, no. 227, Aug. 1919, pp. 326-333, I fig. Apparatus in which heavy oil, with aid of tiny

stream of compressed air makes fan-shaped flame. Designed for use in kitchen range or for industrial operations. (To be continued.) 40c.

NEW DEVICES

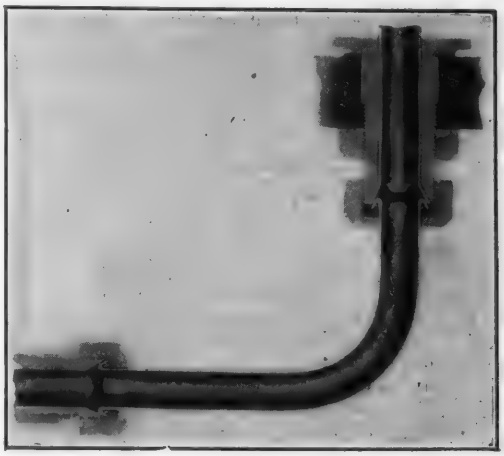
Reilly Fuel-Oil Heater.

Now that coal is such a scarce commodity and so expensive, attention is naturally turned to oil as a fuel.

One of the important items in the proper burning of fuel oil in power plant boilers is the heating of the oil before it goes to the burners, as this is necessary to insure proper vaporization, and therefore, good combustion of the fuel oil.

In this connection the Reilly fuel oil heater is of timely interest. It consists of a cast-iron shell, suitable for a working steam pressure of 250 lbs. per square inch, with a heating surface of helical coils of seamless drawn steel tubing. The oil is pumped through the coils before the oil passes to the burners. Live steam in the shell of the heater is regularly employed as the heating agent, because sufficiently high oil temperatures cannot be secured if exhaust steam is used.

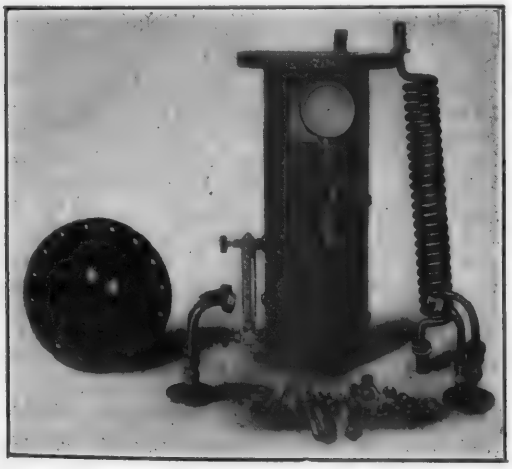
Inasmuch as the condensed high-pressure steam is returned to the boiler in order to conserve the heat in this condensation, it is essential that provision be made to prevent the possibility of a leakage of the fuel oil into this condensed steam. The Reilly fuel oil heater is so constructed that there are no oil joints inside the steam space. This eliminates any possibility of a leakage of oil into this condensation.



FUEL-OIL HEATER JOINT USED WITH REILLY APPARATUS

By referring to the illustrations showing the fuel-oil heater disassembled, and to the drawing showing the section of the Reilly patented fuel-oil heater joint, the distinctive features can be readily appreciated.

This heater is manufactured by the Griscom-Russell Co., New York City, and is used in the United States navy and merchant marine, as well as in stationary power plants.



REILLY FUEL-OIL HEATER DISASSEMBLED

A New Radiator Humidifier.

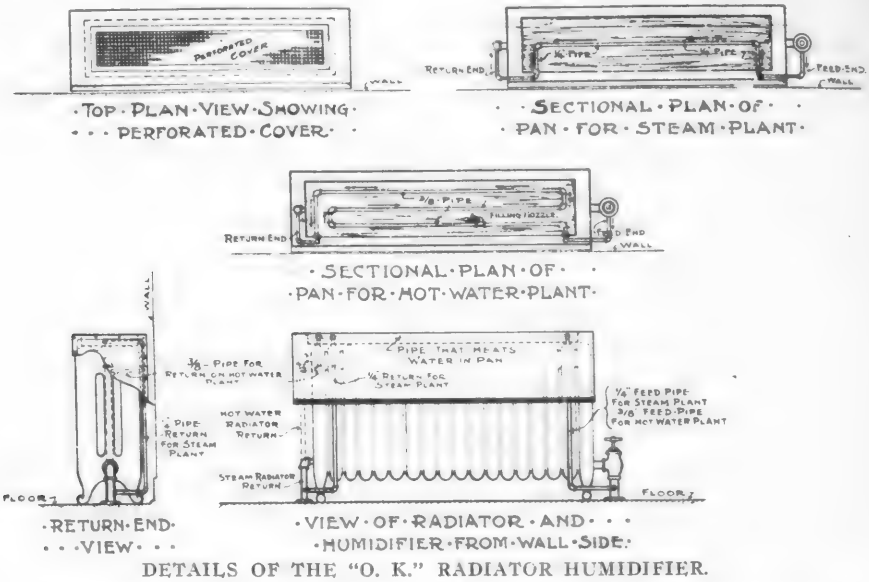
A new type of room humidifier, intended to be placed on top of the radiator, has lately appeared on the market, having been developed by G. W. Olson and Chas. F. Kroon. Mr. Olson is superintendent and Mr Kroon Engineer for one of the general hospitals in Minneapolis, Minn The patentees have organized the Olson-Kroon Co., in that city, to exploit the device.

It is known as the O-K humidifier and consists of a water pan placed on top of the radiator, with a coil of ¼ or ½-in pipe inside of the pan. Over the pan is placed a metal hood with a loose or hinged cover of perforated metal, the cover being the same size as the water pan. The hood is made with an apron in front to conceal the pan and a low apron back of the radiator to protect the wall against the rising dust.

The coil in the water pan in connected by pipes running down back of

the radiator to the steam or water supply and return pipes. For steam, ¼-in. pipe is used, for water ½-in. For steam the coil may be only a single length of ¼-in. pipe inside the pan; for water it is preferably returned so as to make two lengths of pipe in the pan, it being de-

6-in. vacuum, or 8 quarts with a hot-water coil, the water in the heater averaging 130° F. The inventors state that it is entirely possible in a house or building fully equipped with these humidifiers to cut the cost of heating in two and gain, besides, vastly improved condi-


PERFORATED COVER
WALL
TOP PLAN VIEW SHOWING PERFORATED COVER
RETURN END
FEED END
SECTIONAL PLAN OF PAN FOR STEAM PLANT
RETURN END
FILLING NOZZLE
SECTIONAL PLAN OF PAN FOR HOT WATER PLANT
WALL
⅜ PIPE FOR RETURN ON HOT WATER PLANT
PIPE THAT HEATS WATER IN PAN
½ RETURN FOR STEAM PLANT
¼ FEED PIPE FOR STEAM PLANT
⅜ FEED PIPE FOR HOT WATER PLANT
HOT WATER RADIATOR RETURN
STEAM RADIATOR RETURN
FLOOR
RETURN END VIEW
VIEW OF RADIATOR AND HUMIDIFIER FROM WALL SIDE

DETAILS OF THE "O. K." RADIATOR HUMIDIFIER.

sirable to increase the heating surface because of the lower temperature of a water heating system.

While the humidifier is placed on top of the radiator, it really operates quite independently of it. The radiator may be entirely shut off at the valve and yet steam or hot water may be passing through the coil in the water pan and produce evaporation. If water is kept in the pan, vapor and a pleasant degree of heat will result even with a cold radiator. No other humidifier yet invented, it is stated, accomplishes this. The O-K humidifier is, in fact, an auxiliary radiator and, it is claimed, results in increasing the capacity of any radiator by more than 50%. In moderate weather the radiator is not needed at all.

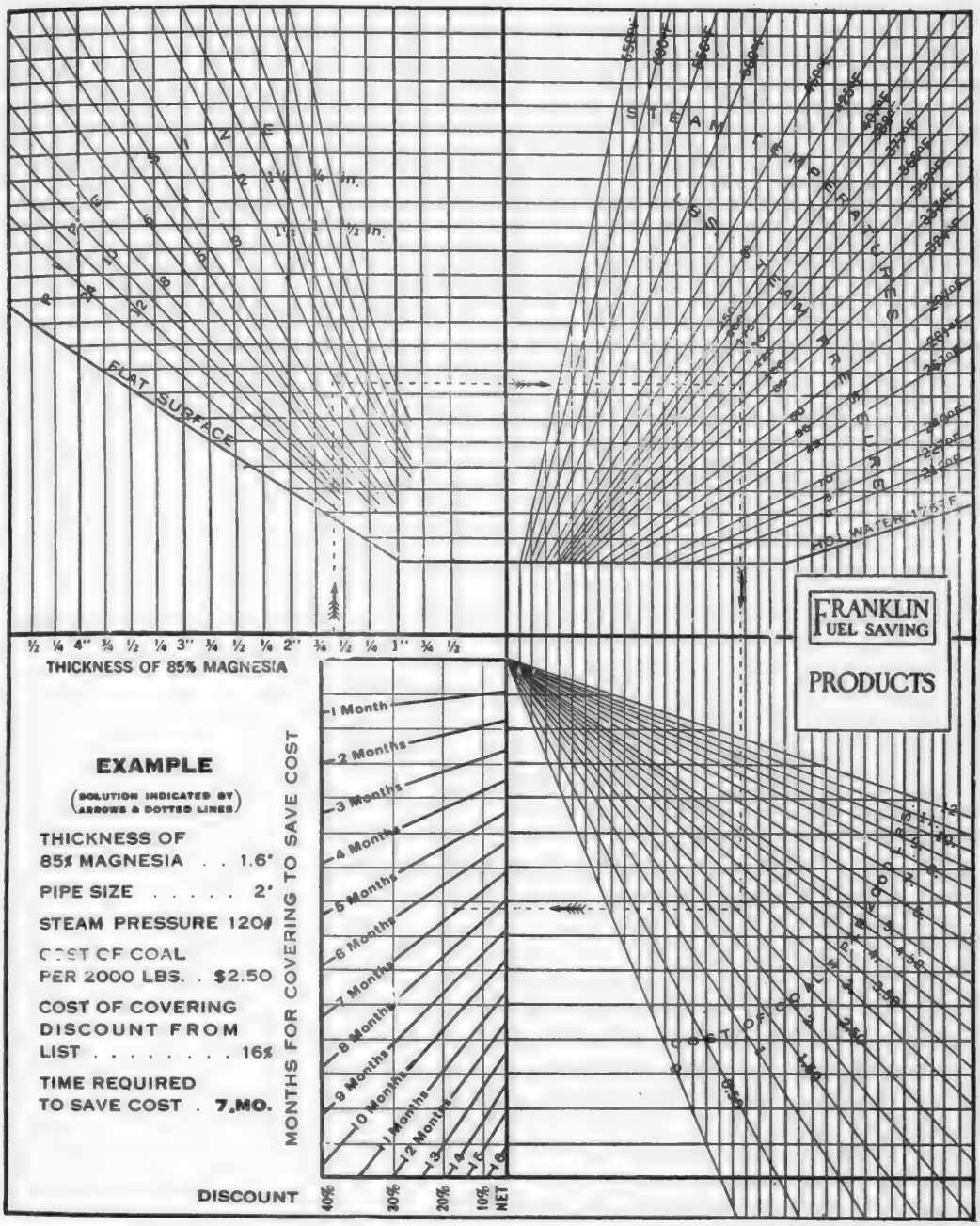
The saving of fuel effected by this device is said to be remarkable. A room with a radiator of 48 sq. ft. of heating surface may be comfortably heated by the O-K humidifier alone, this humidifier containing 30 in. of ¼-in. pipe, or, in the case of water-heating system, 50 or 60 in. of ½-in. pipe. The possible saving in fuel in obvious.

A humidifier of this size will evaporate 16 quarts of water in 24 hours, with steam passing through the coil under a

tions of temperature affecting the health of the occupants.

Trade Literature.

BULLETINS ON DUNHAM HEATING SERVICE, comprising a series of manuals on this subject, have been issued under one cover by the C. A. Dunham Co., Chicago, Ill. The first bulletin (No. 101) is devoted to the Dunham radiator trap. Its construction and operation are explained at length, the illustrations including details of radiator and coil connections, showing how the trap should be used under widely-varying conditions. Bulletin No. 102 covers the Dunham blast trap which, it is stated has been produced to meet a demand for a trap embodying the principles so successfully used in the Dunham radiator trap, that will be adaptable to the heavy service required for blast-coil heaters. This bulletin also offers numerous suggestions, with illustrations, of the proper methods of mailing connections of the blast traps to Vento heaters, as well as to pipe coils. Bulletin No. 103 takes up the Dunham medium-pressure trap, D style, which is designed for



TIME IN WHICH 85% MAGNESIA INSULATION SAVES ITS COST.

service where pressures are higher than those used in steam heating work, such as hospital fixtures and hotel kitchens and restaurants. Bulletin No. 104 features the Dunham packless radiator valve. Other bulletins feature Dunham oil separators, suction strainers, reducing-pressure valves, vacuum pump governors, the Dunham air line valve, the Dunham home heating system, the Dunham return heating system and the Dunham vacuum heating system. The last two bulletins (Nos. 111 and 112) are entitled "How to Install the Dunham Home Heating System" and "Data on Dunham Heating." These two bulletins, as well as the others, will prove of great value to both engineers and contractors in vapor or vacuum heating. Size of bulletins, 8¼ x 11¼ in. each.

SIROCCO SERVICE for October, 1919, published by the American Blower Co., Detroit, Mich., contains illustrated descriptions of installations of ABC apparatus, notably in the Frederick and Nelson Department Store in Seattle; the Hutchinson High School, in Buffalo; the Curtiss Aeroplane and Motor Mfg. Corporation's plant in Buffalo; the National Cash Register Co.'s plant in Dayton; the John Deere & Co.'s plant in Grand Detour, Ill.; and the Fort Garry Hotel, in Winnipeg, Man.

HEAT INSULATIONS are the subject of an elaborate catalogue issued by the Franklin Mfg. Co., Franklin, Pa., and devoted to Franklin fuel-saving products. In addition a large portion of the catalogue is taken up with a reference section embracing suggestions to laymen, suggestions to engineers and architects, date on losses from unprotected heating surfaces, value of insulation, sample working sheets for tabulating heating and insulation data, the economy of 85% magnesia insulation, proper thickness of insulation, a suggested specification, and concluding with data on the theory of heat conduction. The fore part of the catalogue is devoted to a description of the company's products, accompanied by an interesting table for the selection of the proper product for any particular purpose. Size 8 x 11 in. Pp. 78.

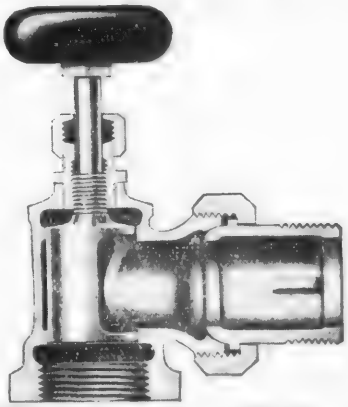
THE COSTIMETER, a new type of time recorder that automatically prints the starting, finishing and elapsed time on one or more jobs in one operation on one card, which automatically prints overtime at increased rates, and which automatically changes from week day to Saturday and Sunday schedules, is a unique device described in circular matter issued by the Costimeter Co., Detroit, Mich. The circular covers each operation in detail and is accompanied by illustrations of the various steps. The New York representative for the Costimeter is J. Eisenstein, 1123 Broadway.

TYPE OF SERVICE	INSULATION RECOMMENDED	REMARKS
Cold Water Pipes. Drinking Water Lines. To Prevent Freezing.	Franklin Special Cold Water Wool Felt Pipe Covering	Condensation-proof Rot-proof
Hot Water Heating Systems	Hot Water Wool Felt Pipe Covering	Cheap and efficient if dry
	Asbestos Air Cell	Vermin and rot-proof Fire-proof
	85% Magnesia	Most satisfactory service and long life
	No 102 Asbestos Cement	For furnace and fittings
Hot Air Heating Systems	Air Cell Paper	Cheap, easily applied
	No 102 Cement	For furnaces and irregular surfaces
Low Pressure Steam Heat	Air Cell Pipe Covering and Blocks	Cheap and light
	85% Magnesia	Most efficient and long life
	Laminduro	As an alternative to 85% magnesia where laminated covering is preferred
	No 102 Cement	For boiler and fittings
STEAM POWER PLANTS		
Steam Pipe	85% Magnesia Pipe Covering	Use correct thickness
Boilers, Feed Water Heaters, Etc	85% Magnesia Blocks	Use correct thickness
Boiler Settings	85% Magnesia and Hard Finish Asbestos Cement	Also prevents air infiltration

INSULATION RECOMMENDED FOR VARIOUS TYPES OF SERVICE

HOW W-C-K SECURES TEAM WORK, being an interview with James C. Boyd, vice-president of the Westinghouse-Church-Kerr Co., Inc., New York, is the title of a reprint of an article appearing in *System* for September, 1919, on "The Same Payroll the Year Round." The Westinghouse-Church-Kerr Company was organized 35 years ago and this story of the company's long experience, organization ideals and methods, contains many points of interest to other firms in engineering lines. The company was an early advocate of the cost-plus contract and for some years has abandoned competitive bidding, agreeing to work only for the client and confining itself exclusively to the sale of its services. A suggestive field organization diagram accompanies the reprint.

RADIATOR VALVES—STEAM—HOT WATER is the title of a useful catalogue published by the Commonwealth Brass Corporation, Detroit, Mich., and devoted to the Lavigne radiator valves. These valves have the advantage of being the result of years of intense application to valve design and manufacture by an organization specializing in radiator valves. The manufacturers pride themselves on producing a valve that, both in workmanship and finished appearance, compares favorably with any other valve on the market. In addition to the valves listed in the catalogue, the company is the sole manufacturer of the Lavigne packless quick-opening steam radiator valves. The first place in the catalogue is given to the steam radiator valve, angle pattern, which has a screw stem with union, and composition discs. The angle pattern next shown is not a dwarf pattern, it is pointed out, as the height of the body enables the disc to rise



CONSTRUCTION OF LAVIGNE WATER RADIATOR VALVE.

higher than usual. The body is a true ball and not cut away to save brass, while the bonnet is cast solid across the square and not cored out. The Lavigne water radiator valves, in angle pattern and in round-body angle pattern, are next shown, the illustrations bringing out in detail their construction features. The angle-pattern type is described as original in design and free from the vice of sticking. It is equipped with shell and stem cast in one piece and is opened or closed by one-half turn of the handle. The stem is threaded just above the shell to engage with a similar thread in the packing gland, this gland performing the double function of holding the shell in place, as well as raising or lowering the shell when handle is moved. Other valve types illustrated are steam radiator valves, corner pattern, globe pattern, and angle patterns with brass disc; lock shield radiator valves, radiator valves, gate pattern; gate valves, union elbows, swinging check valves, angle pattern; and compression air valves. Full data are included, together with roughing-in measurements of valves and elbows. Size 5¼ x 7½ in. Pp. 16.

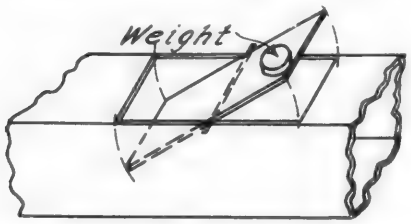
UNIVERSAL CAST-IRON PIPE, which is being used more widely than ever for low-pressure steam heating and central station steam heating, as well as for water, gas, sewage disposal, suction, oil distillation, refrigeration, and dye and acid drains, is the subject of an interesting booklet published by the Central Foundry Co., New York. The booklet illustrates in detail the simple manner in which Universal pipe is laid, the views including typical installations under a wide range of conditions. Among the more important points to remember are: Universal is laid with hub end forward, with the lugs in a horizontal plane; enter joint evenly; pass bolts through lugs with heads pointing in opposite directions and place a washer under each nut; put even tension on bolts by gradually screwing the nuts at the same time or each a little at a time. Another catalogue issued by the same company (Catalogue U-B) is devoted to Universal cast-iron pipe and specials, including bends, tees and crosses, branches or Y's, reducers, flanged and bell and spigot couplings, drip pots, short lengths and nipples. Tabular data concerning each special is included. Size of Catalogue U-B, 3½ x 6 in. Pp. 24.

VANCE STEAM TRAP, manufactured by the Vance-Vetter Co., Pittsburgh, Pa., and described in new circular matter, is attracting considerable attention on the part of heating engineers through the fact that it is constructed with an extra-large discharge valve. The discharge valve opening is ten times larger it is stated, than that of the average trap, making it possible to handle through the tion as fast as it can come through the inlet pipe. The manufacturers offer to loan one on trial. Other steam specialties handled by the Vance-Vetter Company are the Baum separator and the Harry Woods hydraulic-operating valve. The Baum separator, it is stated, separates without reducing pressure, the baffles allowing the steam to pass through in its natural direction and deliver it over 99% perfect. The Harry Woods hydraulic-operating valve has no leather cups and its flat composition discs can be renewed in a few minutes for a few cents without disconnecting valve or pip-

ing. Either of these specialties may also be had on trial.

A Vacuum Relief Valve For Dust Collecting Systems.

In dust collecting systems, a certain degree of vacuum is necessary in order to remove the dust. This vacuum as created by the fan suction may become greater than required to do the desired work, in which event the duct work is liable to collapse from atmospheric pressure. To prevent this, a vacuum relief valve is installed. As its name implies, it relieves the vacuum when too high by automatically admitting air. Its construction is of



VACUUM RELIEF VALVE FOR DUST-COLLECTING SYSTEMS

sheet metal in the form of a damper turning on a rod across its middle length, one end being weighted to balance the required working pressure. If desired, the weight can be arranged to slide on a damper.

Do You Know?

Do you know the young fellow who works for $25 a week and who is wearing a new winter suit that cost $85?

Do you know the wage earner who loafs because he is afraid if he does too much he'll "work himself out of a job."

Do you know the housewife who is ashamed to be seen with a market basket on her arm or to carry home a brown paper bundle?

Do you know the manufacturer who, when the price of raw materials and overhead goes up 5% and the cost of labor advances on equal amount, adds 20% to the price of his goods?

Do you know the factory girl working for $18 a week who is buying and wearing a $350 fur coat?

Do you know the man who lets a fresh clerk sneer him into buying a $15 hat for fear he'll seem "cheap" when he can buy a satisfactory one for $7?

Do you know the investor who has traded his Liberty Bonds for a promise of a 100% profit in a stock company backed by a dishonest promoter?

Do you know the married couple who do not think enough of their children to buy War Savings Stamps for them and to teach them to save?

Do you know the shopper who says "Wrap it up" instead of "How much?"

Do you know the person who lets the desire of the moment destroy the results of days and weeks of thrift and saving?

Do you know the man who thinks it is not necessary to save?

Do you know the man who says that the government savings securities, Liberty Bonds, War Savings Stamps and Treasury Savings Certificates are too slow or too small or too old fashioned for his investments?

IF YOU DO, YOU KNOW PRETTY WELL WHAT IS THE MATTER WITH THE UNITED STATES.

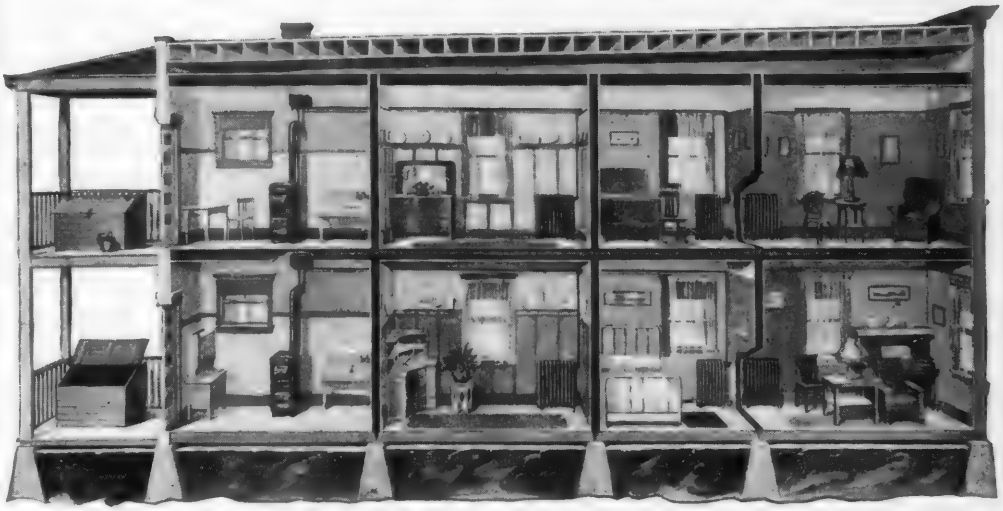
Deaths.

George T. Coppins, formerly secretary of the Walworth Mfg. Co., Boston, Mass., and a familiar figure for years at conventions of the heating and pipe fitting trades, died at his home in Newton, October 22. He had played a large part in the affairs of the Walworth Company, having held the office of secretary from 1882 to 1913. Few men had a wider acquaintance or were more universally liked than Mr. Coppins. He was prominent in masonry and Grand Army circles. Mr. Coppins retired from active business in 1913 and was the first of those known as the "Walworth Old Guard" to drop out. He had been confined to his bed for several months.

A. B. Chambers, treasurer of the Pierce, Butler & Pierce Mfg. Corporation, New York, died suddenly in New York, October 28. Mr. Chambers was formerly associated with the N. O. Nelson Mfg. Co., of St. Louis.

William B. Gray, Louisville, Ky., author of many articles and books on heating and plumbing subjects, died at his home in Louisville, November 8, from bronchial tuberculosis. He was 53 years old. For several years he was an instructor and lecturer on plumbing in the Louisville Young Men's Institute. He also collaborated with the American School of Correspondence in Chicago, in the preparation of the institute's encyclopedia on technical subjects.

IDEAL-ARCOLA
Radiator–Boiler
Hot Water heat for cellarless buildings!



The permanent solution of the heating problem for group flat buildings such as the above is found by specifying the IDEAL-Arcola Radiator-Boiler. Each tenant operates his own heating system.

The IDEAL-Arcola Radiator-Boiler is specially designed to fill the individual heating demands of factory and community housing plans. For individual or groups of cottages, houses, flats, stores, schools, stations, etc. Great fuel saving, together with the desirable and equitable warmth of Hot Water Heating, is secured.

Write today for special literature illustrating and describing the IDEAL-Arcola

IDEAL-Arcola Radiator-Boiler Takes the place of the parlor stove and sends its excess heat to AMERICAN Radiators in adjoining rooms. No cellar required.

AMERICAN RADIATOR COMPANY

Sales branches and showrooms in all the large cities

VAPOR HEATING

The Broomell System

(Continued from Data Sheet No. 132-E)

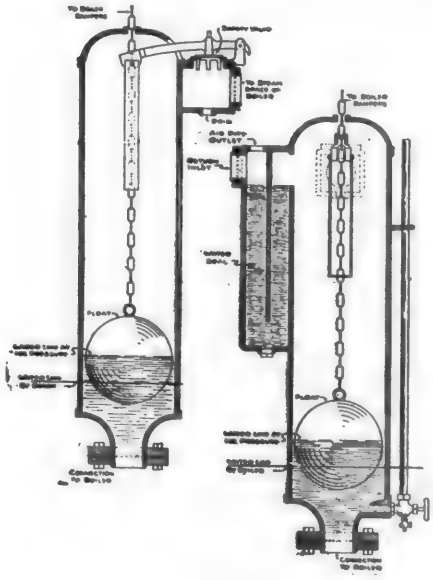


FIG. 5.

At the receiver the water seal causes a separation of the air and condensation, the air passing up into the air line which is connected to the chimney. In this line is placed a small amount of condenser surface for the purpose of reducing to water any vapor which may be contained in the air, thus making the air exhaust into the chimney absolutely dry.

In running the return main the line pitches down continuously to the entrance of a combined regulator-receiver at a grade of not less than ½-in. in 10 ft. The horizontal runs between the union elbow and the riser for radiators on upper floors pitches toward the riser and is made ½in. in size while the risers are not made less than ¾-in. and are connected to the return main through horizontal branches which pitch down toward the main.

After being separated from the air the water of condensation sinks down in the receiver and eventually finds its way into the boiler through the lower pipe connection.

A detail of the receiver is shown in Fig. 5 and it will be noted that the water in the receiver has its surface vented to the air through the opening in the shell just above the relief valve; the return inlet at the same time is water-sealed, as well as the air-pipe outlet.

The distance between the wate-line and that of the extreme high water of the receiver should never be more than 18-in. so that the maximum boiler pressure cannot exceed ¾-lb. Tappings for these receivers are as given in Table IV.

TABLE IV

Radiation Square Feet	Receiver Size	Return Tapping In. Diam.	Air Line In. Diam.
2000 or less	No. 1	2	1¼
2000-4000	No. 2	2½	1½
4000-or up	No. 3	3	2

FANS.

Definitions.

Blower:—A centrifugal blower is a cased fan wheel having two inlets for the admission of air, one on either side and each concentric with the shaft.

Exhauster:—An exhauster is of much the same construction as a blower, but has only one inlet, and that usually in the side farthest from the pulley, engine, turbine or motor.

Overhung Wheel Fan:—An overhung wheel fan is one where the wheel is overhung upon the shaft; that is, where both of the bearings supporting the shaft are on one side of the wheel. This is usually arranged so that the pulley runs between the two bearings, and the shaft is extended through the fan casing to take the wheel. Exhausters are nearly always of the overhung wheel type, except in the larger sizes.

Overhung Pulley Fan:—An overhung pulley fan is one in which there is a bearing on either side of the fan wheel. The shaft being extended through one of the bearings to take the pulley, which is overhung upon it. Blowers and large exhausters are usually of the overhung pulley type.

Discharge:—The discharge of a blower or exhauster is designated by the direction in which the air is delivered from the casing; as for instance, bottom horizontal discharge or upblast discharge.

Hand:—The hand of a fan is that which designates upon which side of the casing the pulley or other driving apparatus is located, when one is facing the outlet of the fan A right-hand fan is one having the pulley, engine, turbine or motor on the right as one faces the outlet, and a left-hand fan is one having the pulley engine, turbine or motor on the left as one faces the outlet. An exception to the above occurs when the pulley, engine, turbine or motor is placed in the inlet, of a single-inlet fan, in which case the housing itself may be left hand, and yet the pulley, engine, turbine or motor may be on the right. In such cases, which are very infrequent, and usually impracticable, full explanation should be given to avoid confusion.

With up or down angular discharge, also, the hand is determined by the location of the motor, turbine, pulley or engine, when the observer stands at the discarge end of the fan.

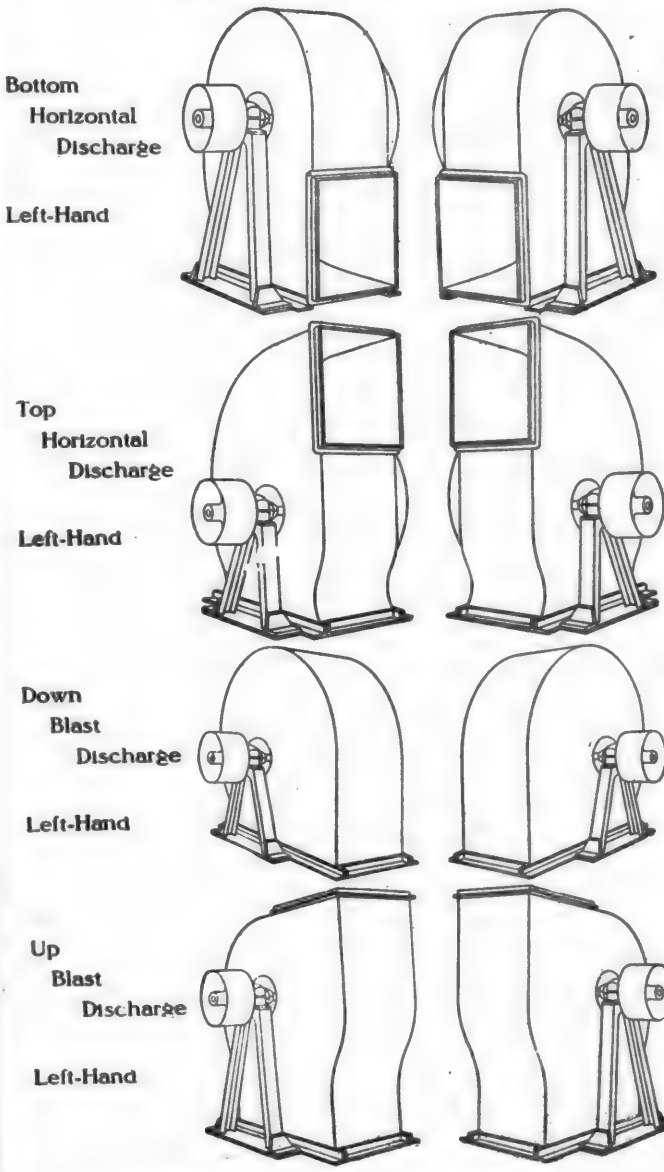
Full Housing Fans:—A fan with full housing has a complete scroll or casing.

Three-fourths and Seven-eighths Housing Fans:—When the lower portion of the scroll is dispensed with, and the fan is located upon a foundation which serves the purpose of a lower part of the casing, the fan is called three-fourths fan, in the steel plate type, and seven-eighths housing fan in the multiblade type.

FANS

Hand and Discharge of Fans

Standard Types for Belt Drive—Overhung Pulley.



B. F. Sturtevant Co.

FANS—Hand and Discharge | No. 136-A.

BELTING.

In Europe cog-wheels are used to transmit power almost exclusively; but in America 99% of the power transmitted is by belting. Cog-wheel transmission is positive, belting is not, because with every revolution of a pulley a portion of the power is lost; the loss varies with the condition of the belt, change of load, state of the atmosphere, etc. The power of a belt to transmit motion is derived from the friction hold on the pulley; this is governed by the pressure or tension; a safe maximum working tension is about 45 lbs. per inch in width.

No dogmatic rule can be laid down to determine the efficiency of a belt. After a series of numerous experiments, Joshua Rose ("Modern Machine Shop Practice") states that belts vary from 25% to 100% in efficiency, for reasons given above.

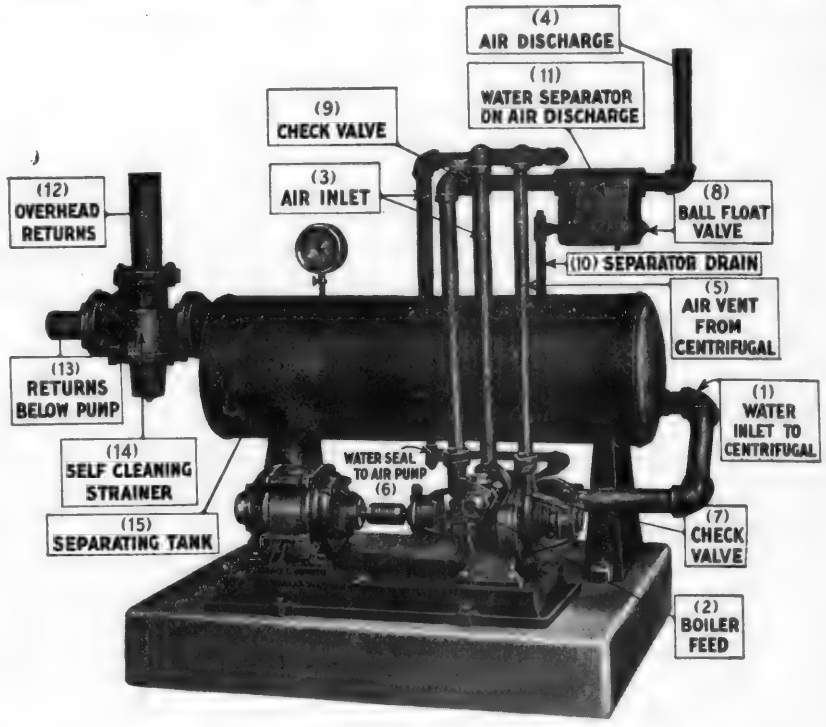
A long belt will transmit more power than a short one, of same width and tension. Consequently long belts are always the best if it is possible to use them. A 1-in. belt traveling 800 ft. per minute and with proper tension will transmit 1 horse-power. If the same belt travels 1,600 ft., the power will be doubled. Each additional inch to the width will add 1 H. P., at the same speed and tension.

A belt under good conditions will deliver 97% of its efficiency. If the belts are too tight there will be quite a loss from friction of the journals, etc.; if too loose, there will be still more loss by slipping. Excessive slipping also dries out the leather and reduces the adhesion. Within reasonable limits the greater the speed the more efficient a belt will be. About 3,750 ft. per minute seems to be the maximum. A double belt will last longer than a single one, will take double the tension, and will transmit 1.7 times as much power, as capacity to transmit power is governed by the frictional width of belt and its pulling strength. Belts should be used with the hair side to the pulley. If pulleys are covered with leather, there will be a gain of 25% in wear of belt and in power transmitted.

It is best to have the belts run off from the main shaft in opposite directions to equalize the strain on the bearings. Let the diameter of the pulleys be as large as possible within the maximum belt speed (3,750 ft. per minute); a belt should never be overworked, and the tension such as will give a slight sag when in motion.

The per cent. of power lost by shaft journal friction should not exceed 20% of the full load; if it does it may be charged to tight belting. The breaking strength of good leather belting per inch in width in the solid leather, 675 lbs.; at rivet holes, 362 lbs.; at lacing holes, 200 lbs. It will be seen, therefore, that belts would be far more durable if lacing could be done away with, as is being done in some establishments, the ends of belts being lapped and cemented, thus making the joints as strong as the body of the belt.

Efficient Heating
demands the JENNINGS PUMP



Size C for 26,000 square feet radiation, requiring only 2 H. P. Motor at 1,720 R. P. M., when delivering from a vacuum 10 inches mercury against a boiler pressure of 10 lbs.

The Jennings Pump consists of two independent turbine units, an air pump and a water pump, combined in one casing, with the impeller of each mounted on the same shaft.

One unit continuously exhausts air and vapors from the heating system, and the other removes the condensation as it accumulates and forces it directly into the boiler, or up to the hot-well.

The boiler pressure is against the water only. The air and vapor, representing approximately four-fifths of the volume handled, are delivered to the atmosphere *without back pressure. The saving in horse power amounts to over 50 per cent.*

The Pump is bronze fitted throughout. The shaft is tobin bronze. The air rotor, water impeller, lobe, port plate, sealing rings and clamping nuts are bronze. The shaft is supported on high grade annular ball bearings mounted outside of the pump casing.

Write for Bulletin No. 8

NASH ENGINEERING CO.

SO. NORWALK, CONN., U. S. A.

TRADE AND MISCELLANEOUS NOTES

Miscellaneous Notes.

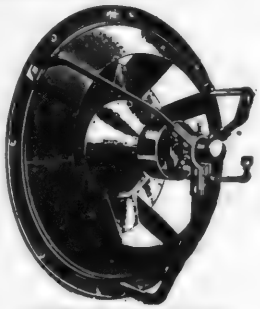
Seventh National Foreign Trade Convention will be held in San Francisco, Cal., May 15-20, 1920. It is planned to make it a world conference of American foreign traders.

Cleveland Engineering Society has moved into its new quarters on the fourteenth floor of the Hotel Statler, Cleveland, O.

John Wiley & Sons, Inc., New York, publishers of technical books, announce an increase in the retail prices of a number of their publications. Kent's "Mechanical Engineers' Pocket Book" has been advanced from $5.00 to $6.00. Harding and Willard's "Mechanical Equipment of Buildings (Vol. 1, "Heating and Ventilation") has been increased from $4.00 to $5.00.

American Institute of Electrical Engineers discussed "Present Limitations of Steam Turbine Design," at a meeting held November 14, in the Engineering Societies Building, when the speakers included F. D. Newbury and J. F. Johnson of the Westinghouse Electric & Mfg. Co., and Eskil Berg, of the General Electric Co.

October building operations, in a review published by F. W. Dodge & Co., showed that in the territory north of the Ohio and east of the Missouri River, the operations amounted to $300,382,000, which is greater than the figures for any previous month of this year. It was an increase of $76,801,000, or 33% over the total for September, the September total having been somewhat less than that for August. Of the total amount for October, 34% or $105,663,000 was for residential buildings; 25% or $78,249,000 was for industrial plants; and 15% or $45,939,000 was for business buildings. Public works



DUPLEX CONE FAN
Belt Driven

HOWARD & MORSE
45 FULTON ST., N. Y.
Ventilating Engineers and Contractors
MANUFACTURERS OF
BLACKMAN and DUPLEX CONE FANS
which are installed by us complete with **Motors, Duct Work and Wiring.**

Aligning, Rigging and **Hoisting** done, with labor thoroughly qualified from long experience.

We make a specialty of **Kitchen Exhaust** work. Prominent buildings, hospitals, theatres, and private residences are among our many and recent installations.

The **Duplex Cone** Fans are semi-conoidal fans, made especially to operate against pressure in duct systems.

The **Blackman** Fans are used for fresh air delivery and in duct systems, when no great pressure is involved.

You can have the advantage of our experience.

SEND FOR CATALOGUE

BLACKMAN FAN
Direct Connected to Motor

and utilities amounted to $42,334,000. In New England, the gross total shows an increase of $2,581,000 over the figures for September and brings the total for ten months' business to $188,109,000, which is a record figure. In New York State and Northern New Jersey, the total is $53,-219,000, which is less by $14,081,000 than the amount for September. The total expenditure for new construction, however, for the ten months of the year, $435,-093,000, is the highest figure recorded for this region during the last ten years. The Philadelphia, Baltimore and Washington districts showed a marked increase over September. In the Pittsburgh district, which includes western Pennsylvania, Ohio and West Virginia, the total was $61,622,200. From January 1, to November 1 the total new construction work in this district was $341,052,000, the largest of the ten years in which records have been kept. The Central West district also made a new high record for the first ten months of 1919. In the Northwest, including Minnesota and North and South Dakota, the total for new construction during the first ten months of 1919 came to $51,-654,000, which has been exceeded only once before, in 1916.

Des Moines, Ia.—In a contribution to

ILGAIR UNIT HEATERS

NOW USED BY MANY OF AMERICA'S INDUSTRIES EVERYWHERE

AMAZINGLY EFFICIENT FOR HEATING IN WINTER AND COOLING IN SUMMER

FORD EAGLE PLANT, DETROIT, MICH.

The above immense industrial plant—the largest of its kind—required abundance of heat. It was economically secured with 60 "ILGAIR" Unit Heaters.

Write for literature describing this outfit and illustrating many important installations.

ILG ELECTRIC VENTILATING CO.
158 Whiting St. CHICAGO, ILL.
Branches in all Large Cities

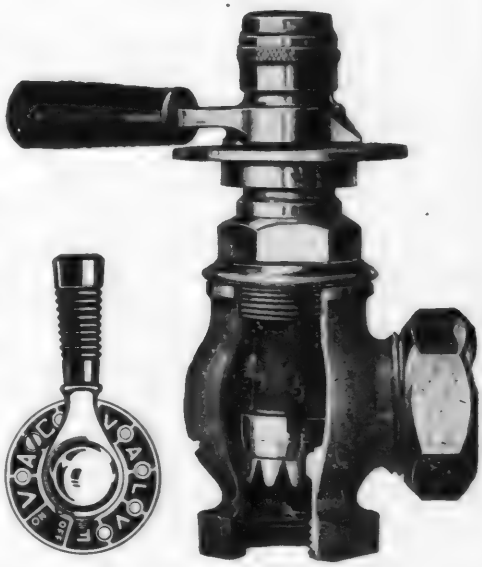
HIGH EFFICIENCY TRADE ILG MARK VENTILATING MACHINERY

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

DETROIT PACKLESS RADIATOR VALVES

The Correct Radiator Valve for Vapor Heating

The Detroit Packless Vacu Valve is a Graduated Valve for Vapor and Vacuum Systems of Heating. The dial plate is provided with a series of holes and a movable pin. This pin acts as a stop for the handle pointer, and is inserted in the hole in the dial nearest the point at which the valve, when opened, admits only sufficient vapor or steam to fully supply the radiator.



DETROIT PACKLESS
Vacu Valve Showing Dial Plate and Lever Handle

Booklet VP-1 Gladly Sent Upon Request

DETROIT LUBRICATOR COMPANY
DETROIT, U. S. A.
Canadian Detroit Lubricator Company, Ltd. Walkerville, Ontario

LARGEST MANUFACTURERS OF RADIATOR VALVES IN THE WORLD

the *Des Moines (Ia.) Capital,* Roger Keith, manager of the Keith Heating Co., has some interesting things to say on the mistakes of warm-air furnace heating made in operating heating apparatus. He says, among other things:

"At this season of the year a great many mistakes are made and a great many people become prejudiced against warm air heating because of the inadequate supply of really experienced furnace men for the three months' rush. The result is that the public will hire any irresponsible party who turns furnace man while the profits are good so long as that party can immediately save them from the prospect of going without a fire.

"A certain amount of relief from the early troubles with heating has been made possible by proper co-operation with architects and building contractors to get houses designed better so that pipes would be straighter and shorter in the houses of recent years. Another attempt has been made to simplify existing troubles with installation by offering and widely advertising the so-called pipeless furnace.

"I speak of this latter without prejudice for or against it, even though our firm has not made a policy of making any extravagant claims for them without qualifications as to the kind of a place to be heated. From the practical standpoint it is a well known fact that the pipeless furnace is about forty years old, but has always been recommended for schools, churches and places all in one room where the ideal opportunity for circulation prevails.

"The more nearly a house approaches this condition with non-interference from partitions and doors the better the results will be, but it is obvious that some places are not adapted to them. It is true, however, that they are great fuel savers and it is a good thing that they have come into common use to replace stoves because they keep floors warm and help to conserve the country's fuel supply for the less fastidious people.

"But the man who has a properly designed house, a carefully planned and installed piped furnace, has, to my mind, the very best heating system of all, considered from all angles of convenience, upkeep and original outlay.

"In conclusion I wish to say a word about grates and the heat loss from windows and to sound a little warning to the

PIPE BENDING

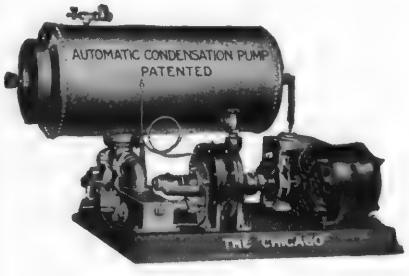
MARINE EQUIPMENT AND REPAIR WORK
HEATING AND VENTILATING

THE OHIO HEATING AND PIPE BENDING CO.

Main Office and Factory, 1061-63 West 11th Street, Cleveland, Ohio

SOLE AGENTS FOR

F. J. Nice Oil and Combination Oil and Gas Burners



The "CHICAGO"
AUTOMATIC CONDENSATION PUMP AND RECEIVER

The only Condensation Pump fitted with a horizontal TILTING TANK RECEIVER containing no troublesome floats. The automatic apparatus is positive in its action. The pump is equipped with two out board ring oiled bearings, one on each side of the casing, insuring a constant and proper oil lubrication at all times.

Write for descriptive bulletin

CHICAGO PUMP COMPANY, 912 W. Lake Street, Chicago, Illinois

GET IN THE BIG MONEY CLASS NOW

SANITARY HEATING AND VENTILATING ENGINEERING

SANITARY, Heating and Ventilating Engineering offers wonderful opportunities for advancement and money making right now. Modern methods and appliances are fast replacing the old ones, and the men who are up-to-date—the trained men—the men who know—are going to reap the benefit.

Get your share of the big money now. Here is the first thing for you to do—tear the coupon off this page and mail it to us today. It won't obligate you in any way and you don't have to send a penny, but it will bring you these four big volumes—just off the press—packed full of the very things you need to train yourself—all worked out for you in clear, understandable English by eighteen of the most successful men in these professions today.

No matter what your job is or how much you earn, you need these books—and you need them now. If you are in business for yourself, they will make your business bigger and better—the volume on business management, estimating and contracts and specifications alone will do it.

SHIPPED FREE Examine the books and see for yourself just how valuable they are, but don't send us any money. The little coupon is all you need. Fill out all three lines and mail it NOW. It will bring you the whole set of books by express collect, and you can keep them seven days to use as you please—study them at home—take them to your shop—try to find some problem they won't answer, and ship them back at our expense if you think you can get along without them. If you want to keep the books after seven days' use, send us only $2.00. The balance can be sent in monthly payments of $2.00 each until the special introductory price of **$14.80** is paid.

It will take years of hit-or-miss experience to gain what these books will give you in a short time; so don't pass up this opportunity—ACT NOW. We may never be able to offer this low price and these special terms again—only 7 cents a day. Tear the coupon off now before you lay this down and mail *today*.

AMERICAN TECHNICAL SOCIETY
Dept. H 1078 CHICAGO, U. S. A.

4 big volumes, size 5-1/2 x 8-1/4 inches, bound in flexible American Morocco and trimmed in gold: 1454 pages: over 1100 pictures, diagrams and plates.

HERE'S WHAT THE BOOKS CONTAIN Thousands of problems under the following headings are all worked out and made as simple as A-B-C.

Sanitary Science and Materials.
Water Supply. Hydraulics.
Sewers and Drains.
Drainage and Venting.
Sanitary Appliances. Sewage Disposal.
Bacteriology and Sanitation.
Infectious Diseases.
Steam and Hot Water Fitting.
Domestic Hot Water Supply.
Heating and Ventilating Engineering.
Sheet Metal Work.
Business Management. Estimating.
Contracts and Specifications.
Mechanical Drawing.
General Index and Review Questions and Index to Each Volume.

FREE CONSULTING SERVICE With these books goes free a year's consulting service in the American Technical Society, worth $12.00. This enables you to consult our engineers and experts for one year without charge. Ask as many questions within the scope of the book as you want for one year.

AMERICAN TECHNICAL SOCIETY
DEPT. H 1078 CHICAGO, U. S. A.

Please send me the 4-volume Library of Sanitary Heating and Ventilating Engineering for 7 days' Free Examination, shipping charges collect. I will send you $2.00 in 7 days and $2.00 each month until the special price of $14.80 is paid, and you will send me a receipt showing the books are mine. If I decide not to buy I will return the books in 7 days.

Name.....

Address.....

Reference.....

private buyer who finds he will need a furnace next spring or even during the winter.

"No one has ever developed a grate in a boiler, stove or furnace that will not burn out in one hour or so if there is any ash in the fuel. If you put a fire on one side of the grate, air will have to reach it on the other side at all points at all times while the fire is going. You can leave ashes against the grate for twenty years if you do not build a fire and you can burn an ashless fuel for twenty years and you will still have good grates in anybody's heater.

"But thirty minutes of fire with ashes shutting out the air underneath will put the same "anybody's" grate out of commission and send you to the furnace man to pay him his profit on your carelessness. You might as well throw a rock at an eight or ten dollar window because the window merchant replaces the damage at a profit, as this is one of the rules of the game.

"The average window with a fifteen-mile wind blowing against it introduces several cubic feet per hour per window of cold air into your house for you to heat with coal you pay for. A thirty-mile wind is worse and when it is below zero there is little argument against the first cost of good weather strips or storm windows because the window itself when perfectly tight loses five times as much heat as a single thickness of plaster, to say nothing of plaster wall paper, lathe and siding in the average residence along with the dead air space between them.

"The wise man will, therefore, look to his chimney for draft, his furnace for the source of heat and the house to keep it. The same wise man always hunts the furnace man who is competent at a season of the year when the latter has nothing to do but kill time. He is then anxious for a job and pains with the job and the price are figured accordingly."

Manufacturers' Notes.

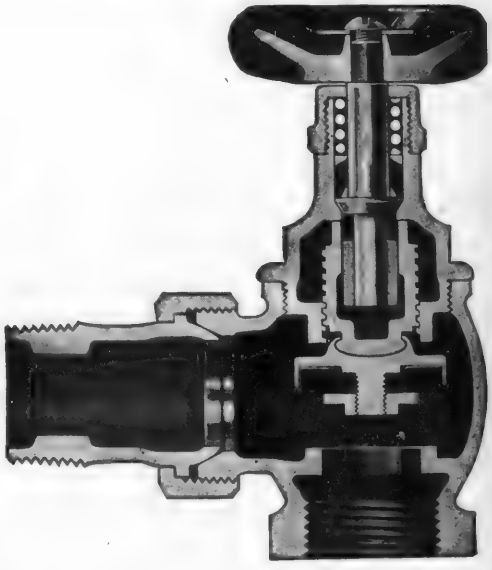
Warren Webster & Co., Camden, N. J., announce, with regret, the resignation of Frank G. Phegley as manager of the company's Cleveland office, in order to enter the professional field as consulting engineer in heating and ventilating work. Mr. Phegley has been connected with

MARSH
RE-ENFORCED
PACKLESS
VALVES

QUICK OPENING
Examine Construction Carefully

In this line of Packless and Modulated Valves the Packless Feature is, through construction, special metal composition of Packless bearing and a packing cushion, made PRACTICALLY INDESTRUCTIBLE and, although a POSITIVE seal within itself, it is the ONLY line in which the Packless feature is, through a PACKING CUSHION and a very heavy special spring, AUTOMATICALLY RE-ENFORCED, providing TWO or DOUBLE, INDEPENDENT, POSITIVE, bonnet seals for ALL TIME.

These Valves will withstand high pressures and, therefore, are of superior value for vacuum and low pressure service.



We SPECIALIZE on high grade Radiator Valves and furnish the LARGEST LINE of any company in the business.

Printed matter and prices on application

MARSH VALVE COMPANY, Erie, Pa.

the Webster organization for the past nine years. The company's Cleveland office, at 706 Rose Building, will hereafter be under the direct management of the home office. Clyde W. Colby, who has an extensive acquaintance with the heating trade in northern Ohio, has been appointed as Cleveland district manager, and will have associated with him, as assistant district manager, William Roebuck, Jr., who has been a part of the home office sales-engineering force during the past nine years.

Yeomans Bros. Co., Chicago, Ill., manufacturers of electric pumping machinery, has moved its general office and factory to its new building at 1433 Dayton St., Chicago, where the company has greatly improved facilities for the manufacture of its line of condensation return pumps and other products.

Prudential Heater Co., Louisville, Ky., whose incorporation with a capital stock of $50,000, was announced in last month's issue, was organized to take over the manufacture and sale of the Prudential line of boilers, heretofore made by the

HERE'S a better, simpler, surer Radiator Trap.

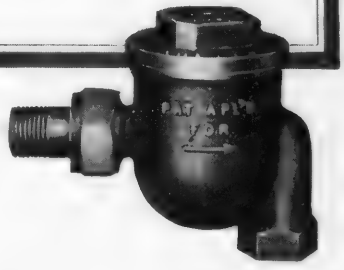
It costs no more to buy and install. It costs *nothing* to adjust.

Because there isn't a thing about it to get out of order or tamper with.

The Johns-Manville Radiator Trap installed means a job cleaned up quick—without any come-backs to eat up profits.

How It Works

It's a hollow copper ball that does the work. As water flows into the trap, the ball rolls up, exposing the outlet, and water is discharged. Any air that may be present is also drawn off. But when the water level falls, the ball rolls down with it and seals the outlet. Steam can not pass the trap.



Through Asbestos and its allied products JOHNS-MANVILLE Serves in Construction, Heat Insulations, High Temperature Cements, Asbestos Roofings, Packings, Brake Linings, Fire Preventive Products

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities

JOHNS MANVILLE
Radiator Trap

JENKINS BRASS "WHISTLE" VALVES
STOP WATER WASTE

At the Case & Martin Pie Bakery, in the department where fruits are washed and prepared. Jenkins Brass "Whistle" Valves are installed on hot and cold water supply lines to stop water waste.
A pull of the lever instantly permits a free full flow of water which is automatically shut off by means of a spring as soon as the lever is released.
Jenkins Brass "Whistle" Valves are extensively used in bath houses, garages, restaurants and factories, and, doubtless, numerous other uses will occur to you for these substantial, quick opening valves.

Know Jenkins Valves by the Jenkins "Diamond Mark."

JENKINS BROS.
New York Boston Chicago Montreal Philadelphia London

Jenkins Valves

Prudential Heater Co., of Akron, O., of which A. G. Cripps was manager. In announcing the sale of the Prudential patterns for the down-draft, square, surface burning and round-surface burning boilers, it is stated that the Akron company found that it was beyond its ability to supply the demand for this boiler in the past few years. For the good of the trade and so that orders might be filled promptly and the manufacture of the boilers carried on with better facilities, the company's interests were sold to the Prudential Heater Co., of Louisville. The incorporators, as announced last month, are: George Laib, Phil. Laib and W. G. Probst, all of Louisville.

Fulton Co., Knoxville, Tenn., has appointed the Arthur A. Schley Co., Arrott Building, Pittsburgh, as its representatives in Pittsburgh and nearby territory.

Minneapolis Heat Regulator Co., Minneapolis, Minn., announces new list prices and new model designations for its line of Minneapolis heat regulators. The new list prices and model numbers are contained on a special sheet suitable for being pasted in the company's catalogue.

Gordon Radiator Co., 154 West 18th St., New York, manufacturers of radiators and other heating apparatus, is building a two-story reinforced concrete factory, 100 x 262 ft. at Wales Avenue and 143rd St., New York. The building will cost $60,000. H. B. Gordon is president of the company.

Utica Heater Co., Utica, N. Y. will increase the output of its plant one-third by the erection of four new buildings at its plant in Utica, including an office building, a warehouse, a fireproof pattern storage warehouse and a new core room. The buildings are now under way.

Minneapolis Heat Regulator Co., Minneapolis, Minn., is building an addition to its plant at Fourth Avenue, South and 28th Street, which will more than double the present size. The improvement and equipment will run to $100,000. Pipe & Cook have the general contract. Building operations are now under way and will be continued throughout the winter. The additional space and equipment will treble the company's manufacturing output and will require an increase in the company's force from 150 to 300 people.

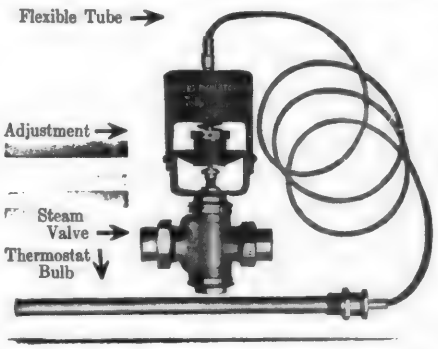
Make Better Use of Man-Power

Help relieve the labor situation by urging manufacturers to put machines on the automatic jobs, releasing men for the work machines can't do.

Help further by showing how automatic *heat control* saves labor, material, and time; improves results and increases output.

Get posted on the possibilities of automatic heat control for industrial processes. It's one of the live issues of the day.

The Powers Regulator Company
Specialists in Automatic Heat Control



No. 11 REGULATOR is entirely self-contained, requiring no air or water pressure for operation. Automatic, reliable and accurate. Peculiarly adapted to the control of water cooling, steam cooking, pasteurizers, acid baths, glue heaters, hot water tanks, etc., etc. Ask for Bulletin 129.

POWERS BULLETINS

These Bulletins contain much helpful data on automatic heat regulation as well as descriptions of Powers Regulators.

They should be in your files. We'll gladly send them on request.

954 Architects Bldg., NEW YORK
2143 Mallers Bldg., CHICAGO
365 The Federal Street Bldg., BOSTON
The Canadian Powers Regulator Co., Ltd., Toronto, Ont.

"American Spreader" Floor Ventilators

An Improved Mushroom Type Ventilator for use Under Seats in Theatres, Halls, etc.

Designed by one of America's leading Heating and Ventilating Engineers

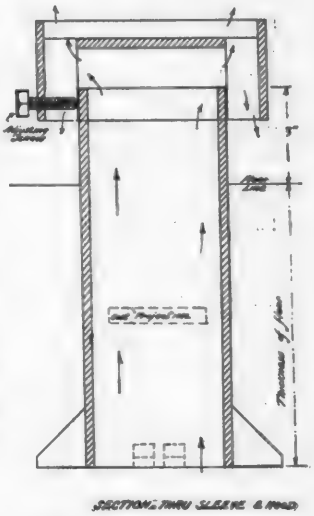
Made of Castiron—Indestructible.

Provides an even distribution of air in all directions.

Adjustable set screw regulates exactly the amount of entering air.

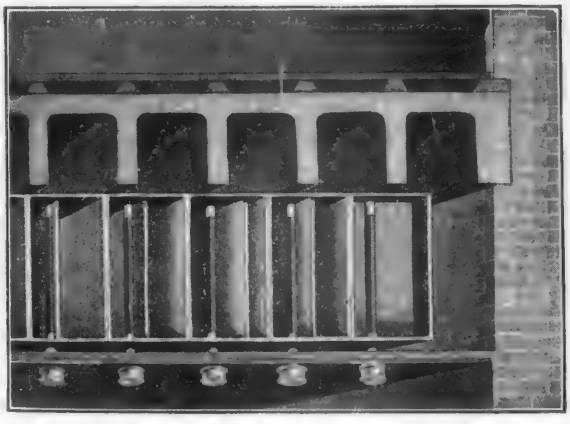
Sanitary—Supply pipe always covered.

Prices of these *superior* ventilators in line with prices of *ordinary* type.



AMERICAN FOUNDRY & FURNACE CO.
BLOOMINGTON, ILLINOIS

The Perfecto Damper Regulator and Indicator



when placed on a battery of ducts in the collecting chamber near the machinery room not only affords an easy and convenient means of regulating the flow of air, but also serves as a positive means of indicating the room to which each duct leads, by means of the numbered or lettered cover windows.

Send for Descriptive Circular

THE SIXTH CITY SHEET METAL WORKS CO., Cleveland, O.
Galvanized Iron Work for Heating and Ventilating Systems

Central Station Heating Notes.

Taylorville, Ill.—The heat consumers of Taylorville failed to reach an agreement on heating rates for this season with the Central Illinois Public Service Company, after a conference had been arranged at the instance of Mayor T. J. Downey. The heat consumers' committee met with District Superintendent Kelly, of Mattoon. Mr. Kelly showed, as did the former committee, that the company's operating expenses last year were double its income of $13,000. He also showed that if the full meter rate were paid by all consumers, the company would still run behind. Ernest Hoover, chairman of the consumers' committee, offered on behalf of the consumers to pay the old flat rate, plus 75% of same, the coming season. Mr. Kelly stated he would consider this matter and report later. He promised also to send a heating expert to Taylorville to solve the discrepancies under the meter system. Former managers have admitted that the system in Taylorville is antiquated and that there is no way to establish an equitable charge unless an entirely new system is constructed. If the company continues to charge the meter rates, it is the intention of the consumers to ask the utilities commission for new mains, and a return line for the condensation.

Garrett, Ind.—An increase in the city's water, light and steam heating rates is proposed, to become effective January 1 next. The city council has directed City Attorney J. D. Brinkerhoff to communicate with the Indiana Public Service Commission, the purpose being to determine just what the increase should be. A petition will then be filled with the commission for this raise. The council has already acted upon proposals of Engineer Hufferd, of the Public Service Commission, relative to the best means of temporarily improving the water and light plant. The substance of the recommendations of the engineer for the permanent improvement of the plant follow:

"Build a boiler room to the east of the present boiler room to house two new 300 H. P. water-tube boilers.

"Erect coal foot, 72 in. inside diameter, stack to be connected to the two boilers and to the remaining old boiler.

"Erect coal bunkers between the proposed new boiler room and the present siding.

QUANTITATIVE
DETERMINATION OF AIR DUST

Dr. Hill Dust Counter—Pat.

Dr. Hill Dust Counter

THE Simplest, Most Reliable and Most Satisfactory Instrument ever Designed for Testing the Purity of Air for Dust and for Determining the Efficiency of Air Washers and Air Conditioning Apparatus

Especially adapted for use by Boards of Health, Chemical and Physical Laboratories, Universities and Colleges, Hospitals, and Industrial, Mechanical and Consulting Engineers.

ATMOSPHERIC CONDITIONING CORPORATION
LAFAYETTE BUILDING
PHILADELPHIA

"Sirocco"

TRADE MARK

Oakland City Hall
Oakland, California

Architects: Palmer & Hornbostel, New York City
Heating Engineer: H. C. Meyer, Jr., New York City

IN many cities the buildings belonging to the municipality and housing the municipal departments are a grave reflection upon the taste and judgment of those responsible for their appearance and arrangement.

The city of Oakland, California, however, is an exception. Here is a classic city hall, an example of the splendid architecture of the Golden West.

In keeping with the far-seeing arrangement for utility and healthful conditions in every section of the building, the "Sirocco" system of heating and ventilating has been installed. This means dependable service with healthful heating when needed, and a system of ventilation insuring fresh, clean air at all times.

If you are interested in any heating or ventilating proposition, we would like to talk with you.

AMERICAN BLOWER COMPANY

DETROIT, MICH.

Canadian Sirocco Company, Limited, Windsor, Ont.

Branches in all large cities

"Replace the present vacuum pump on the steam heat return lines with a 10 x 12 x 12 in. pump.

"Abandon the north boiler of the two which are now in use; retaining the other in reserve for steam heating service; the top of this boiler and all piping to be well insulated.

"Replace the present vacuum pump on the steam heat return lines with a 10 x 10 x 12 in. pipe.

"Obtain a portable boiler of as large capacity as possible to augment the present boiler installation and provide live steam for the heating service during the heating season and until the permanent repairs can be made."

Mattoon, Ill.—Strong opposition is being encountered in the efforts of the Central Illinois Public Service Company to secure increased heating rates from its customers in Mattoon. The company is asking an increase of 33 1/3% over the temporary increase granted several months ago.

Rock Island, Ill.—140 contracts for city steam heat have been booked by the People's Light Company, which operates the steam plant in Rock Island, in connection with the gas and electric business.

Charleston, Ill.—Charleston patrons of the Central Illinois Public Service Company are opposing the company's proposed increase in heating rates. Commenting on the situation, the *Charleston,* (Ill.) *Courier* says "To a man up a tree the whole thing is in the nature of a farce, for these reasons, which cannot be denied: Some months ago some of the heat users sent lawyers to Springfield to insist that there would be no objection to a raise, but, for the love of Mike, not to discontinue the service. Next, the grocers and threshing engine men have made several raises since 1914, while the heat rates are the same. Next, the city is getting steam heat service free of charge, a direct violation of the utilities rules. It is our candid opinion that heat rates should be raised the same as prunes and coal, and as the users are already on record at Springfield as not objecting to a raise, we cannot see the foundation for objection at this time. In fact, there is nothing to prevent going

The Engineer of the Near Future

will be expected to know exactly what his client means when he says "I want Manufactured Weather for the entire building. I want to make 'Every day a *good* day.'"

If you are not yet familiar with Manufactured Weather I'll be glad to send you my new book, "Weather, and the Story of How it is Manufactured."

It's gratis, of course.

Write right now!

Carrier Engineering Corporation

39 Cortlandt Street NEW YORK CITY

Offices at

Boston Buffalo
Chicago Philadelphia

Yours to make

"Every day a good day"

The Mechanical Weather Man

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Buffalo
Equipped
THE prominent buildings in all parts of the country are equipped with
Buffalo Heating and Ventilating Apparatus
It puts heat, mechanically, just where it is wanted, keeps it in circulation and prevents it from escaping through the ventilators in in the roof until it has been used to the best advantage. Saves coal—increases efficiency of workers.
Catalog No. 198-36 gives valuable engineering data on heating and ventilating problems and our engineering department is always available for consultation.
Buffalo Forge Company
Buffalo, N. Y.
Offices in all Principal Cities
"Buffalo"

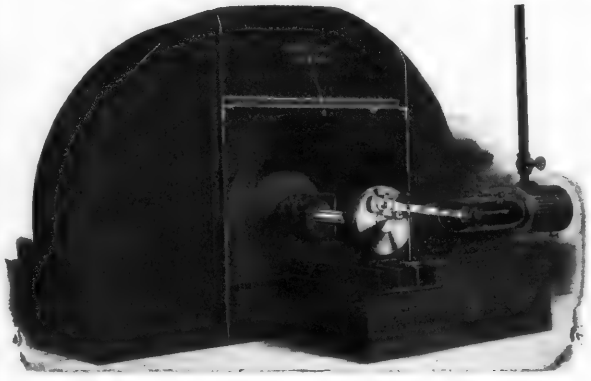
back to the old wood burner, if the rates are too high to be afforded."

Portland, Ore.—More than $200,000 is being spent by the Northwestern Electric Company in enlarging and extending its central heating system. The system was installed at an original cost of $1,000,000. Since that time another $500,000 have been spent on improvements and extensions. The heating plant is located near the plant of the Portland Lumber Company and there the steam is generated and conducted in pipes under high pressure to the business district for distribution throughout the buildings. The heat is generated through the burning of sawmill refuse, the sawdust and refuse being fed into the furnace automatically. For this and other reasons the plant has attracted attention of engineers all along the coast.

Tacoma, Wash.—The organization of the Consumers' Central Heating Company, to take over the Tacoma District Central Heating Company, has just been completed, the capital stock of the new company being $450,000. H. A. Flood, recently of Spokane, who took temporary charge of the affairs of the old company last April, becomes vice-president and general manager of the new company. The other officers are: President, W. R. Rust; first vice-president, J. S. Baker; treasurer, H. A. Alward; secretary, H. S. Griggs. The newly-incorporated company acquires, among other things, the franchise of the old company which still has more than 20 years to run. It is understood that all of the original investors in the heating enterprise not only retain their original investments by taking securities of the new company, but practically all of them will double their former investments. For the last two winters heating service has been more or less interrupted, owing to the fact that the distribution system had been greatly extended and no adequate provision made for the storage of fuel.

Extensive improvements in the source of the heating system in the plant of the Tacoma Railway & Power Company, including the full equipment of ten boilers, an emergency fuel-oil reserve and increased facilities for receiving mill refuse are being undertaken and necessary changes of present pipe lines to insure continuous and uniform service are now being constructed. It is stated that im-

Heating Ventilation
Drying Air Washers
Engines Mechanical Draft



Let us make your plans and estimates

Get Catalogues 65-B and 67-B

OFFICES IN ALL PRINCIPAL CITIES

NEW YORK BLOWER COMPANY

MAIN OFFICE:
513 Transportation Bldg., 608 S. Dearborn St., Chicago, Ill.
Toledo, O.: Room 629 Nicholas Bldg.

WORKS:
Bucyrus, Ohio

How to Get and Handle MORE Business

REPEATEDLY, profitable business is lost because of unrecognized and unavailed opportunity. Right in your own locality are countless Factories, Theatres, Churches, Restaurants, and public buildings in dire need of *reliable* Heating and Ventilating systems. With the aid of consulting engineers and architects economical systems can be designed and installed that will reflect credit and profit to yourself and client. On jobs where no architect or engineer is engaged our engineers will gladly assist in obtaining the proper size fan, drive, etc.

Sturtevant
(REG. U. S. PAT. OFF.)

HEATING and VENTILATING SYSTEMS

For greater strength and efficiency Sturtevant multivane fan wheels have patented cup-shaped vanes which enable Sturtevant multivane fans to deliver largest volumes of air at smallest cost.

WHEN quality of material, efficiency of design and operation, and dependability of construction are governing factors, engineers and architects unhesitatingly recommend Sturtevant systems, known and used the world over. Applicable to all sorts of buildings and to all conditions of service.

Live contractors everywhere are already preparing to "cash in" on the Sturtevant national advertising campaign to popularize the need and benefits derived from fresh air supplied through Sturtevant products.

Tho undisputed leaders for 60 years, our scientific research department is ever constantly striving to improve Sturtevant products.

B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON, MASS., AND ALL PRINCIPAL CITIES

Conveniently located in all the leading business centers, 22 branch engineering stations are maintained—for your use. Feel free to call on them. *Descriptive and illustrated bulletins on request.*

provements are now nearing completion at the St. Paul & Tacoma Lumber Company's plant for storing from 300 to 500 cars of hogged fuel or mill refuse. It is also stated that the Definace Lumber Company is now equipped to furnish from two to three cars of hogged fuel a day and plans for storage at that plant are being considered.

Two additional boilers will be placed in the regular heating service, with approximately 1000 H. P. capacity, making six boilers in regular service, with four additional boilers in reserve, making a total available horse-power of 5000 H. P. It is planned to equip all ten boilers with oil-burning apparatus and equipment so that in an emergency valves may be immediately turned on and steam produced by oil burning oil. As soon as improvements now under way at the power plant are completed, steam will be kept in the mains continuously, thus rendering a 24-hour continuous service.

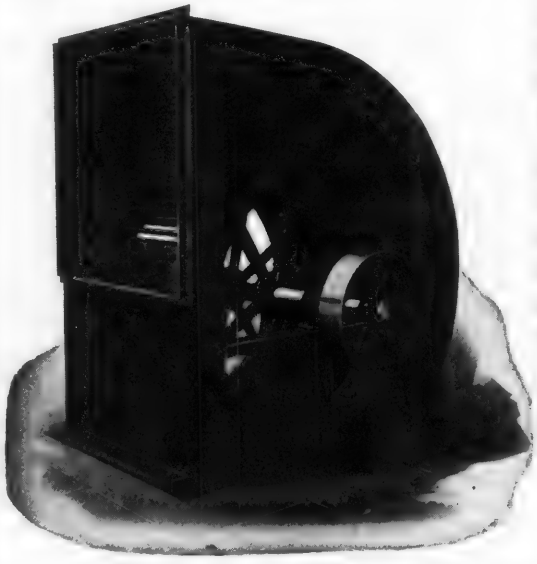
It is stated that one of the causes for inadequate and unsatisfactory service in the past, at the farthest point of distribution, was due to the uneven pressure carried in the steam mains over the system, due largely to dead end steam mains. Tie lines will be constructed in such a manner as to remedy this condition.

Clarence W. May, a technically trained industrial heating engineer, is in charge of the engineering or efficiency department. E. A. Reuter is superintendent of construction of the distribution system with Howard Le Fevre, mechanical and efficiency engineer, in charge of improvements being made at the power plant; and James Nelson as chief operating engineer. New offices have been opened on the ground floor at 1213 A. street, Tacoma.

Streator, Ill.—In a letter received from the State Public Utility Commission regarding the increase in the heating rates in Streator, the commission stated that the plant at that point was serving such a small number of patrons that it would be impossible to put the business on a paying basis without sanctioning a rate so high as to be out of proportion to the service rendered. It was explained that it is the settled policy of the commission not to authorize any such schedule in any case, even though the operating company continued to lose money. The new Streator rate, the commission

Buckeye Multiblade Fans

are made especially for low pressure Heating and Ventilating work. They are giving perfect satisfaction.



CORRECT DESIGN. HEAVY CONSTRUCTION, NOISELESS OPERATION, WORKMANLIKE FINISH, HIGHEST EFFICIENCY.

Our Engineering Department is maintained for the purpose of assisting Engineers, Architects, etc., in planning efficient Heating and Ventilating Systems for all buildings.

THIS DEPARTMENT IS FREE TO YOU.

We also manufacture a complete line of Disc, Cone and Steel Plate Fans.

Write us

BUCKEYE BLOWER CO.

COLUMBUS, OHIO.

Allen H. Stem and Beaver W. Day, Architects.

What part do the FANS play in this Building; and why are they MASSACHUSETTS?

FANS play a very important part in the operation of any public building, but more important perhaps in a building used as a club or for the housing of athletic activities. In buildings of this kind there is a special need of ventilation, and at the same time the very nature of the building presents exceptional difficulties.

For the St. Paul Athletic Club the engineers chose Massachusetts Squirrel Cage Fans because no more satisfactory, efficient, or durable ventilating fans can be secured at any price.

This well known club is only one of many important public buildings equipped with Massachusetts Fans.

MASSACHUSETTS BLOWER CO.
Watertown **Mass.**

New York **Boston** **Chicago**

Branches in 20 Principal Cities Throughout the Country 100-11

MASSACHUSETTS FANS

added, is subject to revision next summer. The increase granted raises the rate for the present season from 75 cents to 85 cents per 1000 lbs. condensation.

Greeley, Colo.—The central steam heating system at the city building has been changed from high to low pressure. A 50-lb. pressure has been carried. Through the installation of an electric pump to operate in connection with the system, the pressure has been reduced to from 5 to 10 lbs.

Logansport, Ind.—The Logansport Utilities Company is one of the first district heating concerns to be obliged to cut off its patrons through a shortage of coal. Oil stoves of every description were dug out and are being used to heat rooms and apartments during the period of the coal crisis.

New Firms and Business Changes.

Richards Mfg. Co., Grand Rapids, Mich., has been incorporated to take over the heating and plumbing business of the Glendon A. Richards Co. Capital stock, $100,000.

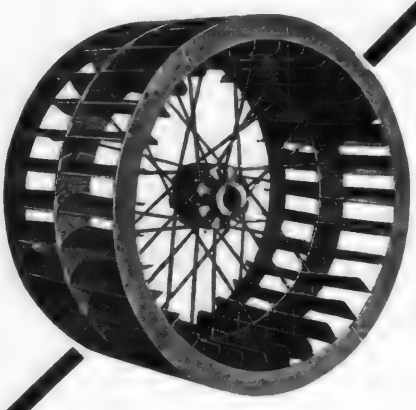
Lynch & Johnson, Atlanta, Ga., is the title of a new heating and plumbing firm composed of John H. Lynch, an old and well-known heating and sanitary engineer, L. S. Johnson, for many years manager of one of the largest heating and plumbing supply houses in the South, and L. L. Horner, an expert in the lighting and water field. The company will conduct a wholesale and retail business, maintaining a warehouse for supplying the trade.

E. R. Little Co., Detroit, Mich., has been formed to succeed the engineering firm of Little & Shepard of that city. The firm, whose offices will be continued at the same address in the Dime Bank Building, will specialize in heating and power plant operation. E. R. Little is president of the organization.

Contracts Awarded.

Merton E. Lewis, Binghamton, N. Y., installing new vapor heating system in the Municipal Building in Endicott, N. Y., for $3,000.

Lane-Pike-Werhoff Co., Lafayette, Ind., installing vapor heating system in the



Bayley

—for Efficient Heating and Ventilation

Applied to modern heating and ventilating requirements, Bayley Equipment, as represented by The Chinook Heater and the Bayley Plexiform Fan, gives a KIND and LENGTH of service that makes it a highly profitable investment.

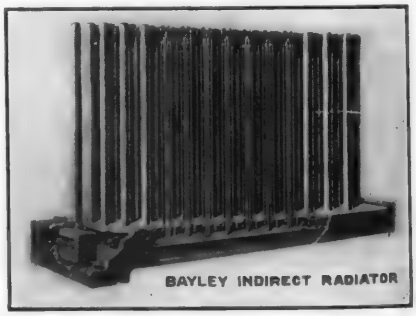
Our engineers will gladly aid you in planning heating installation for buildings of all kinds.

Write for descriptive bulletins, plans and estimates.

BAYLEY MFG. COMPANY

732 Greenbush St., Milwaukee, Wis.

Manufacturers of Heating, Ventilating, Drying and Exhausting Apparatus



BAYLEY INDIRECT RADIATOR

W
WESTINGHOUSE ELECTRIC

Motors and Control for Ventilating Equipment

The use of Westinghouse Motors and Control for driving ventilating equipment in many of the country's leading hotels, office buildings, schools, stores and theatres demonstrates the worth of this apparatus.

Westinghouse ventilating apparatus is rugged in construction. The *quiet* operation of the motors makes them preferable for any installation. They are reliable and durable, and are used by the leading Heating and Ventilating Contractors throughout the country.

Send for our twenty page booklet on Electrical Equipment for Ventilating Service.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.
Sales Offices in all Large American Cities

Westinghouse

It Works

That's Why

The "Little Draft-Man"

Sells at Sight

MORE people than ever before are installing regulators for their furnaces that they can operate from their living rooms of the home. The "Little Draft-Man" is especially popular because it is simple, does not get out of order, works perfectly without fail, and costs little. All you have to do is to set the indicator when you go to bed It opens the damper and closes the check. The house is warm when the family gets up.

Profitable for Dealers

The "Little Draft-Man" may be included with new furnace installations or used in connection with old furnaces. Easily installed. Retails for $15.

Dealers' margin of profits warrants their keen interest. Send for particulars.

Sahlin Manufacturing Company

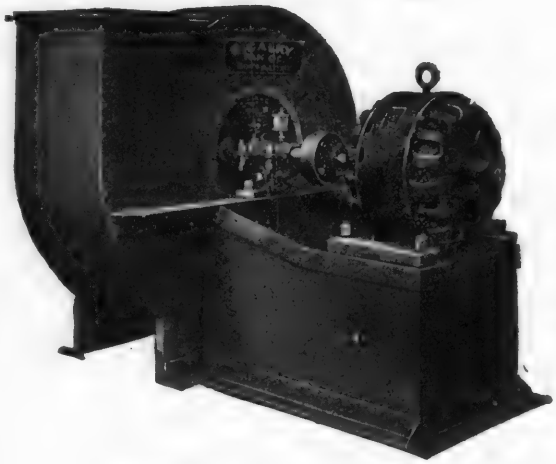
35 Ottawa Avenue, N. W., Grand Rapids, Mich.

Central Christian Church in Lebanon for $4,600.

Standardization in American Construction Industries.

Need for the establishment of further standards in the construction industry was urged in a recent address delivered by Ernest T. Trigg, president of the National Federation of Construction Industries before the Engineers' Club of Philadelphia. After mentioning the fact that the manufacture of the materials entering into construction is less standardized, in some instances, than the manufacture of materials for other industries, Mr. Trigg stated that only a few years ago each manufacturer of materials on which screw threads were used had a special thread for his products. The manufacturer of pipe and fittings for gas meters used a thread made by no other maker. He then told how the Briggs (or American) standard screw thread has come into common use throughout the United States and added that a strong effort will be made by the American delegation at the International Screw Thread Conference in Paris, which opened its sessions November 10, to have the Ameri-

BI-CAL-KY



BI-CAL-KY FANS ARE GOOD

FANS
DUST COLLECTORS
DUST ARRESTERS
AIR WASHERS
ROOF VENTILATORS

Our engineering department stands ready at all times to assist you in securing orders and in making installations. Feel free to write us of your engineering problems

We solicit your inquiries and assure you of our co-operation.

HERSH & BROTHER

(Successors to Bicalky Fan Company)

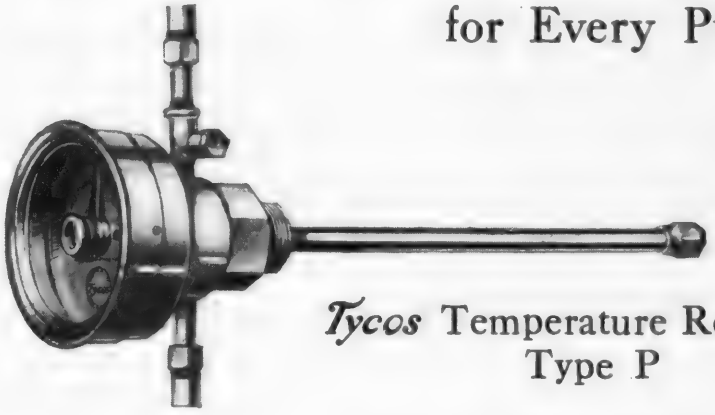
Main Office and Factory

Allentown, Pa.

951 Niagara St. Buffalo, N. Y.

Perry Bldg. Philadelphia, Pa.

There's a *Tycos* or
Taylor Temperature Instrument
for Every Purpose



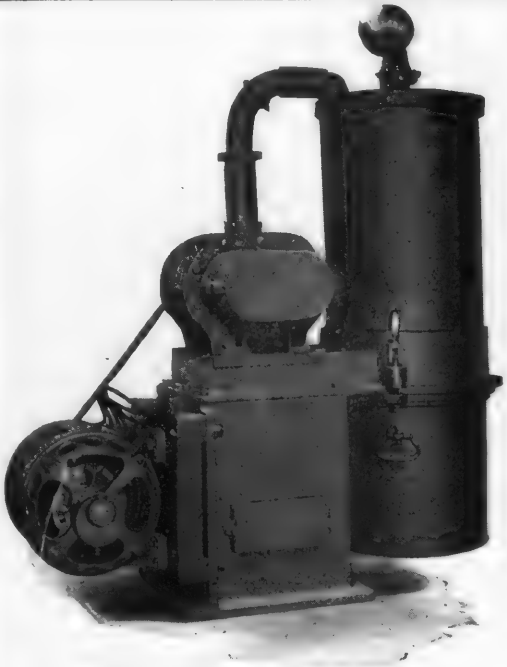
Tycos Temperature Regulator
Type P

But one of the many *Tycos*
Temperature Regulators

Correspondence Solicited

Taylor Instrument Companies
Rochester, N. Y.

(221)



One Sweeper, Belt Drive Unit
Made in
One, Two and Three Sweepers

For Dependability and Efficiency

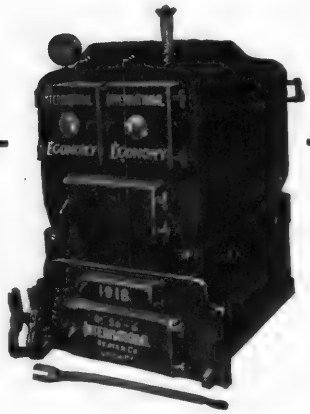
You make no mistake when you specify a Connersville Vacuum Cleaner. It gets maximum cleaning results with the least expenditure of power. Its simple, sturdy construction means long-life without repair.

A Connersville Vacuum Cleaner

has as its vacuum producer a Connersville double impeller rotary blower. Exhaustive tests by the United States Supervising Architect proved its superiority over all other types of vacuum producers.

They are made in all sizes to meet the needs of any size building. None are too large, none too small.

Manufactured by
United Vacuum Appliance Division
of Landers, Frary & Clark
CONNERSVILLE INDIANA



INTERNATIONAL
ECONOMY BOILERS

Tested and rated in accordance with the Code adopted by the American Society of Heating and Ventilating Engineers

In the design of this Boiler, nothing has been taken for granted. Every detail that promotes boiler efficiency has been carefully considered and tested under varying conditions of service. The result is a boiler that is truly entitled to the name ECONOMY.

Special Features of the Economy Boiler

Large ashpit—no connecting bars.
Side draft door.
Grate bar connection outside the ashpit.
High crown sheet—permits deep fuel bed.
Special provision for thoro mixing of gases to promote complete combustion.
Steam dome so designed as to deliver dry steam.

Send for catalog 1296-H describing boiler in detail

INTERNATIONAL HEATER CO.
UTICA, N. Y.

can standard for screw threads made the international standard.

Mr. Trigg summed up the arguments for standardization as follows:

1. It permits of manufacture on a quantity basis.

2. It makes it possible to produce a supply during the slack season, thereby tending to prevent seasonal employment, decreasing labor turnover and facilitating prompt delivery.

3. It reduces maintenance cost and makes repair easier.

4. It eliminates poor design and unsatisfactory supplies.

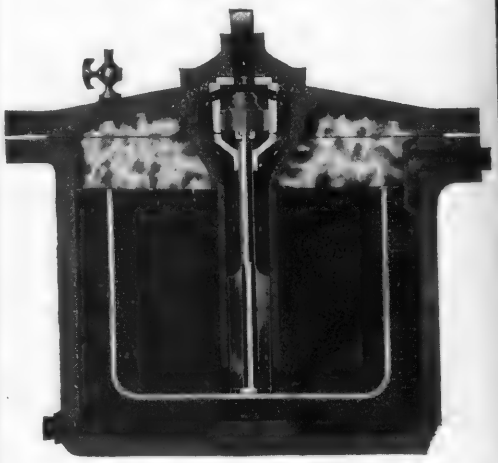
5. It reduces the labor and machine costs, both at the factory and at the site of erection.

6. It makes possible closer co-operation between architects and engineers and the men who produce, distribute and install material and equipment.

7. It assures a uniform degree of safety and efficiency during and after construction.

Mr. Trigg urged the adoption by the National Federation of Construction Industries of such engineering standards as referred to the construction industry.

VANCE Steam Trap



Low Pressure Style

Extra Large Discharge Valve
No Small Parts to Corrode and Stick

VANCE-VETTER CO., Pittsburgh, Pa.

Philadelphia Building Employers Unite.

Sub-contractors and material men of Philadelphia engaged in the building business met at the Hotel Adelphia, in that city, November 11, to consider the advisability of uniting employers in all building trades of Philadelphia under similar methods of procedure as obtain in other large cities. A temporary organization was formed with objects "to foster the welfare, reform abuses, and in all lawful ways promote a greater degree of uniformity and certainty in the customs and usages of the building trades as to credit, protection from unfair contracts of any kind, and fair and just treatment in all business relations. Edwin L. Seabrook, of the National Association of Sheet Metal Contractors, was chairman of the organization committee.

Chicago Contractors Go to $1.00 an Hour as a Wage Basis.

According to the settlement made in the Chicago building trades strike, a wage scale of $1.00 an hour has gone into effect for almost all trades, including plumbers and steam fitters, with double pay for overtime.

WANTED.

Wanted.—Mechanical repair man to take charge of maintenance and repair of all mechanical meters, consisting of GE Steam Flow Meters, Bailey Boiler Meters, Venturi Meters, Recording Pressure Gauges, Draft Gauges, etc., in large plant located at Youngstown, O. Address Baldwin, care of Heating and Ventilating Magazine.

Wanted.—Are you the young man I am looking for? I am in search of a young man who has ambitions and the ability necessary to make a commercial success—

INCREASE YOUR PROFITS
BY INSTALLING OUR
Onward Air Moistener

Used on Furnaces, Hot Water or Steam Boilers.

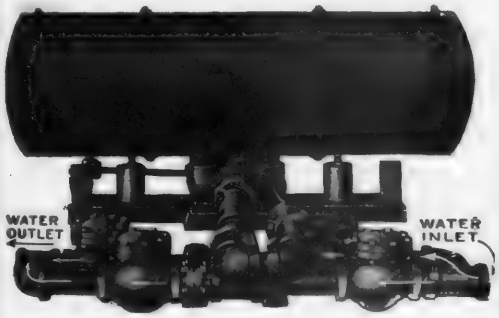
Practically Self Operating.

Does away with Filling Furnace or Radiator Water Pan.

If your jobber will not supply you, write direct.

ONWARD MFG. CO., Menasha, Wis

Does "Farnsworth Equipped" Mean Coal-Saving to You?

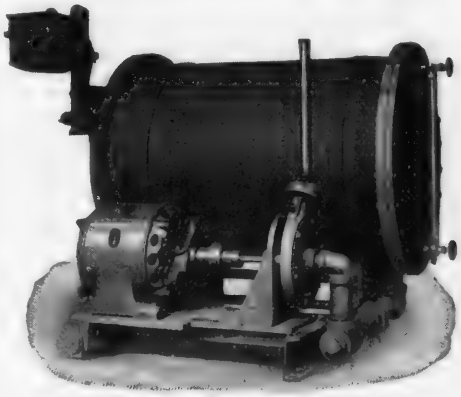


This is the master machine of the Farnsworth Closed System. Place this machine over your Boilers. Discharge all your high pressure traps directly into it. Any L. P. condensation you have in scattered buildings drain to a Farnsworth Condensation pump, which will pump it to this Farnsworth Duplex Boiler Feeder. By this closed system all condensation is held under pressure and fed directly into boilers at a high temperature. This is our method of conserving heat units and thus saving coal The above illustration shows the front view of the 3-inch boiler feeder, with duplex receiving and delivery check valves.

Write for our Literature

FARNSWORTH COMPANY
Engineers and Manufacturers of Condensation Pumps
Conshohocken, Penna.

SAVE CONDENSATION
and return it hot to boilers



ARCHITECTS AND ENGINEERS designing new plants generally provide for economical equipment, but there are many existing low pressure steam heating plants where a surprising amount of fuel could be saved by the installation of

Yeomans Electrically Operated Condensation Return Pumps

Made in Horizontal and Vertical Types for automatic operation

Send for Bulletin C-5000. **Agents in all principal cities**

YEOMANS BROTHERS CO.
223 Institute Pl. **Chicago, Il**

and at the same time is willing to sacrifice and work—and work hard—to attain success—I want a producer. If you have had experience in estimating or designing heating and ventilating so much the better. A college education is not essential but the more you have educated yourself the better—I want to make a heating and ventilating engineer, salesman, manager or owner out of you. Will you let me try? Write, telling me your experience—Manager H. care of Heating and Ventilating Magazine.

Position Wanted—As superintendent of steam, hot water, ventilating and power plant construction. Thoroughly familiar with all modern appliances and systems of the industry. Estimating, laying out and drawing. Address, F. S. Graham, 50 Clinton St., Newark, N. J.

British Coal Production Rising.

According to the American Chamber of Commerce in London, the latest returns of British coal production show a favorable tendency, if the inevitable drop during the period of the recent railroad strike is left out of consideration.

Ross

Surface Barometric and Jet Condensing Equipments for Power Plants.

Main, Auxiliary, Distilling Condensers and Evaporators for Marine Service.

Distilling Condensers for Refrigeration and Chemical Plants.

"Crosshead Guided" Expansion Joints.

Ross Boiler Feed Water Heaters.

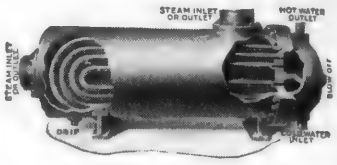
Ross Oil and Sugar Juice Heaters.

Gravity and Forced Circulation Heaters.

Ross Oil, Air and Water Coolers.

ROSS HEATER & MFG. CO.
BUFFALO, N. Y.

THE BRAND THAT LEADING ENGINEERS DEMAND



There's more to a water heating system than mere materials

Almost anybody can buy the materials—make a heater, and, maybe, it would heat water after a fashion, but

it takes "know how"

to design, manufacture and *guarantee*

The Patterson Water Heating System

For 39 years we've been up against the problems of water heating—*furnishing it for all kinds of service*—and we know we can help you.

THE PATTERSON-KELLEY CO. NEW YORK · WATER HEATING ENGINEERS ·

23 Dey St.

THE CORLISS VALVE STEAM TRAP AND OTHER POWER PLANT EQUIPMENT

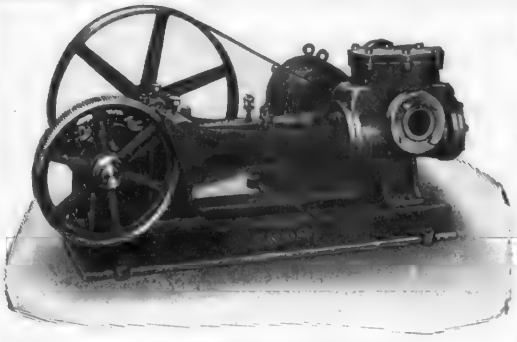
Atlas Reducing Valves, REGULATING DEVICES, Pumps, Air Compressors, Etc.

See Sweet's Catalog—Page 543 and Chemical Engineering Catalog—Page 795

PLANT ENGINEERING AND EQUIPMENT COMPANY, Inc., 192 Broadway, New York City

BRANCHES:

Alabama—113 Hawkins St. South, Birmingham.
California—58 Sutter St., San Francisco.
Connecticut—53 John St., Bridgeport.
Illinois—30 N. Michigan Blvd., Chicago.
Louisiana—847 Baronne St., New Orleans.
Maryland—311 So. Charles St., Baltimore.
Massachusetts—10 High St., Boston.
Michigan—814 Penobscot Bldg., Detroit.
Minnesota—423 Fifth St., South, Minneapolis
Missouri—312 Elmhurst Bldg., Kansas City
Nebraska—504 First National Bank Bldg., Omaha.
New York—119 East Main St., Rochester.
New York—422 River St., Troy.
North Carolina—Box 667, Asheville.
Ohio—3621 Columbia Av., Cincinnati.
Ohio—85 No. High St., Columbus.
Ohio—629 Euclid Av., Cleveland.
Pennsylvania—1207 Hartje Bldg., Pittsburgh.
Pennsylvania—1503 Sansom St., Philadelphia
Utah—17 Exchange Place, Salt Lake City.
Virginia—1225 Clark Av., Roanoke.
Wisconsin—428 Jefferson St., Milwaukee.
Cuba—Victor G. Mendoza Co., Cuba, No. 3 Havana.
Jamaica—Kingston Industrial Works, Kingston.
Canada—Box 1053, St. Johns, N. B.



This Outfit is Noiseless

Economy Return Line Vacuum Pumps

Electric or Power Driven High Class Bronze Fitted

PRICE CAN'T BE BEAT

Quantity production in specialized lines enables us to make prices that others making a large variety of apparatus cannot meet.

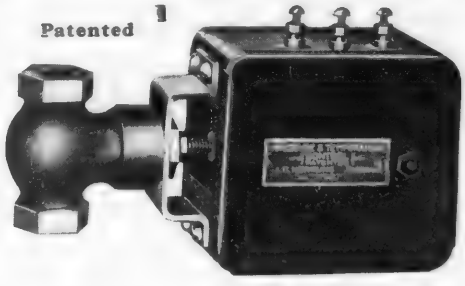
Keep in Step with the Times Be a Specialist

Buy your Return or Air Line Vacuum Pumps, Condensation or Hot Water Circulating Pumps from Manufacturers who specialize in pumps for the Heating Trade.

Don't fail to write for "ECONOMY MANUAL "B." Most complete vest pocket Heating, Ventilating Engineer's Hand Book. This publication mailed free on request.

ECONOMY PUMPING MACHINERY CO.
120-128 N. Curtis St., Chicago, Ill.

Patented



The HORNUNG Magnetic Valve

This is the little valve used as a pilot on all sizes of HORNUNG PRESSURE and TEMPERATURE CONTROL VALVES. It has many other uses.

Ask for Catalog No. 14

CENTRAL HEAT APPLIANCES

J. C. HORNUNG

343 South Dearborn Street CHICAGO

HEATERS

¶ Whether it is a fifteen horse-power feed-water heater or fifteen thousand K. W. primary feed heater, a service heater for a two-basin lavatory or a hot water convertor with a thousand gallons a minute capacity, the Whitlock heater you buy will be exactly suited to the work for which it is intended.

¶ Whitlock heaters are made in the widest possible range of types and design for varying duties. They are built of the best materials by skilled workmen, according to carefully thought out designs. Specify "Whitlock."

THE WHITLOCK COIL PIPE CO.
HARTFORD, CONN.

New York Chicago Philadelphia
Buffalo Boston

Whitlock Heaters have everlasting Copper Tubes

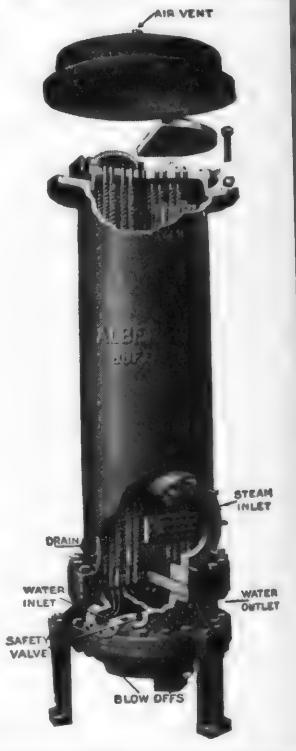
PRACTICAL POINTS

to Consider in a Water Heater

1. The water should be broken up into small particles and thus presented to the heating surface. A great deal of the effectiveness of the heater depends on this item.

Helically-corrugated tubes accomplish this in the

ALBERGER
MULTI-HEAD
WATER HEATERS



Especially adapted for Hotels, Laundries, Office Buildings, Apartment Houses, Hospitals, and Factories.

Send for Bulletin 201-V

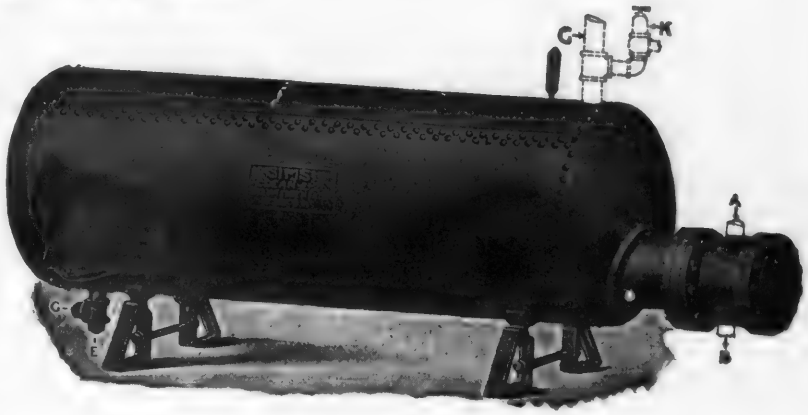
ALBERGER HEATER CO., Buffalo, N. Y.

Meet that Peak Demand for Hot Water

WITH A

Sims Clean E-Z Steam Tube Heater

For hotels, apartment buildings, hospitals, Y. M. C. A. buildings, schools, etc.



For Live or Exhaust Steam

Especially Designed for Supplying Large Quantities of Hot Water

Send for tables showing heat capacities using steam at various pressures

"We keep others in hot water" **THE SIMS CO., 18th St., Erie, Pa.**

"WAINWRIGHT" Service Heaters

Wainwright Horizontal Floating Head Heater

Bulletin No. 27 Describes Heaters used in Hot Water Heating Systems for large Plants with Forced Circulation.

ALBERGER PUMP & CONDENSER CO.

140 CEDAR STREET, NEW YORK

Boston Chicago St. Louis Philadelphia

ENGINEERS' SPECIFICATION INDEX

AIR COMPRESSORS.
Plant Engineering & Equipment Co., New York.

AIR CONDITIONING APPARATUS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corporation, Philadelphia, Pa.
Carrier Air Conditioning Co., Buffalo, N. Y.
Carrier Engineering Corporation, New York.
New York Blower Co., Chicago, Ill.

AIR COOLERS.
Alberger Heater Co., Buffalo, N. Y.

AIR COOLING AND DRYING SYSTEMS.
Atmospheric Conditioning Corp., Philadelphia, Pa.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, New York.
Clarage Fan Co., Kalamazoo, Mich.
Hersh & Bro., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

AIR MOISTENERS.
Onward Mfg. Co., Kenosha, Wis.

AIR WASHERS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Philadelphia, Pa.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Air Conditioning Co., Buffalo, N. Y.
Carrier Engineering Corporation, New York.
Hersh & Bro., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

BOOKS
American Technical Society, Chicago, Ill.

BLOWERS.
FAN.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Hersh & Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co.,Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

PRESSURE.
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Connersville Blower Co., Connersville, Ind.
Hersh & Bro., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Roots Co., P. H. and F. M., Cleveland, O.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

ROTARY.
Connersville Blower Co., Connersville, Ind.
Roots Co., P. H. and F. M., Cleveland, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURBINE.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

BOILERS.
HEATING.
American Radiator Co., Chicago, Ill.
Gorton & Lidgerwood Co., New York.
Gurney Heater Mfg. Co., Boston, Mass.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Newport Boiler Co., Chicago, Ill.

DOWN-DRAFT.
Illinois Malleable Iron Co., Chicago, Ill.
Newport Boiler Co, Chicago, Ill.

MAGAZINE-FEED.
Newport Boiler Co., Chicago, Ill.

CALORIMETERS.
Sarco Co., New York.
Schaefer & Budenberg Mfg. Co., Brooklyn, N.Y.

CEMENT, BOILER, PIPE AND RADIATOR.
Shur-Tite Mfg. Co., Cleveland, O.

CHIMNEY PIPE.
Cannelton Sewer Pipe Co., Cannelton, Ind.

COILS, PIPE.
Gold Car Heating & Lighting Co., New York.
Simmons C., John, New York.

CONDENSERS.
Alberger Heater Co., Buffalo, New York.
Alberger Heater & Condenser Co., New York.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CONVERTERS, HOT WATER.
Patterson-Kelley Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

COVERING, PIPE.
American District Steam Co., No. Tonawanda, N. Y.
Century Conduit Co., Pittsburgh, Pa.
Hornung, J. C., Chicago, Ill.
Johns-Manville Co., H. W., New Yor.
National Asbestos Mfg. Co., Jersey City, N. J.
Ric-Wil Co., Cleveland, O.
Underground Specialties Co., New York.
Wyckoff & Son Co., A., Elmira, N. Y.

CONDUITS, PIPE, UNDERGROUND.
(See Underground Pipe Conduits).

DAMPERS, DUCT.
Sixth City Sheet Metal Works Co., Cleveland, O.

DEHUMIDIFYING APPARATUS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Philadelphia, Pa.
Carrier Air Conditioning Co., Buffalo, N. Y.
Carrier Engineering Corporation, New York.

DUCT WORK, AIR.
Howard & Morse, New York.

DRYING SYSTEMS.
(See Air Cooling and Drying Systems).

DUST COLLECTING SYSTEMS.
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

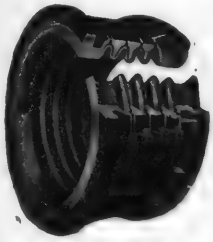
DUST COLLECTORS.
Atmospheric Conditioning Corp., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DUST DETERMINATORS.
Atmospheric Conditioning Corp., Philadelphia, Pa.

ECONOMIZERS, FUEL.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS.
Hoffman Specialty Co., New York.

ENGINES.
STEAM, AUTOMATIC.
American Blower Co., Detroit, Mich.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



NECESSITY DEMANDS *the use of* BADGER SELF-EQUALIZING EXPANSION JOINTS

CHANGES in temperature cause material changes in length of steam, air, water, and other pipe lines. To care for these changes safely a Badger Self-Equalizing Expansion Joint should be installed in a pipe line, otherwise the pipe joints will work loose and leak or the fittings may become fractured, due to the irresistible strain of expansion and contraction.

Send for our new book of complete information No. 10

E. B. BADGER & SONS CO.

101 Park Ave., New York **75 Pitts St., Boston**

Here is a Typical Installation

OF

STATEN'S High Efficiency Sectional STEAM CONDUIT

A thoroughly salt-glazed tile, especially made up in half sections, with roll-frame supports and special conduit insulation, installed complete by us, ready for steam pipes.

Typical installation of Staten's "H.-E." Sectional Steam Conduit

Low Cost, Long Service, Easy Installation

Complete specifications and estimates of cost furnished upon request.

UNDERGROUND SPECIALTIES CO., Inc., 1476 Broadway, New York

ENGINEERS' SPECIFICATION INDEX (Continued).

STEAM, HIGH SPEED.
American Blower Co., Detroit, Mich.
Clarage Fan Co., Kalamazoo, Mich.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EXHAUST FANS.
(See Fans, Exhaust).

EXHAUST HEADS.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Simmons, Co., John, New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wright-Austin Co., Detroit, Mich.

EXPANSION JOINTS.
Alberger Pump & Condenser Co., New York.
American District Steam Co., No. Tonawanda, N. Y.
Badger & Sons, E. B., Boston, Mass.
Cannelton Sewer Pipe Co., Cannelton, Ind.
Central Station Steam Co., Detroit, Mich.
Century Conduit Co., Pittsburgh, Pa.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Co., New York.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Underground Specialties Co., New York.
Webster & Co., Warren, Camen, N. J.

FANS, EXHAUST.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Hersh & Bro., Allentown, Pa.
Howard & Morse, New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FEED-WATER HEATERS.
(See Heaters, Feed-Water).

FEEDERS, BOILER, LOW-PRESSURE.
Farnsworth Co., Conshohocken, Pa.
McAlear Mfg. Co., Chicago, Ill.
Simmons Co., John, New York.
Webster & Co., Warren, Camden, N. J.

FILTERS, FEED-WATER.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FIRE BRICK.
Cannelton Sewer Pipe Co., Cannelton, Ind.

FITTINGS, FLANGED.
American District Steam Co., No. Tonawanda, N. Y.
Simmons Co., John, New York.

FLANGES.
American Dist. Steam Co., No. Tonawanda, N. Y.
Jenkins Bros. N. Y.

FLUE LININGS.
Cannelton Sewer Pipe Co., Cannelton, Ind.

GASKETS, METALLIC.
Sarco Co., New York.

GAUGE BOARDS.
Bishop & Babcock Co., Cleveland, O.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

GAUGES.
DRAFT.
Bristol Co., Waterbury, Conn.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

HYDRAULIC.
Jas. P. Marsh & Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

PRESSURE.
American Dist. Steam Co., No. Tonawanda, N. Y.
Bristol Co., Waterbury, Conn.
Gold Car Heating & Lighting Co., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

GAUGES (Continued)

VACUUM.
Bishop & Babcock Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Marsh & Co., Jas. P., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Taylor Instrument Co., Rochester, N. Y.
Webster & Co., Warren, Camden, N. J.

WATER.
American Dist. Steam Co., No. Tonawanda, N. Y.
Bristol Co., Waterbury, Conn.
Detroit Lubricator Co., Detroit, Mich.
Jenkins Bros., New York.

GENERATING SETS.
American Blower Co., Detroit, Mich.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GENERATOR COOLING SYSTEMS.
Atmospheric Conditioning Corp., Philadelphia, Pa.

GOVERNORS, PUMP.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Plant Engineering & Equipment Co., New York.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

HEATERS.
DOMESTIC WATER.
Alberger Heater Co., Buffalo, N. Y.
American Dist. Steam Co., No. Tonawanda, N. Y.
Patterson-Kelley Co., New York.
Pratt & Cady Co., Inc., Hartford, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

FEED WATER (Closed)
Alberger Heater Co., Buffalo, N. Y.
Alberger Pump & Condenser Co., New York.
Patterson-Kelley Co., New York.
Pratt & Cady Co., Inc., Tartford, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Simmons Co., John, New York.
Sims, Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

FEED WATER (OPEN).
Sims Co., Erie, Pa.
Webster & Co., Warren, Camden, N. J.

PIPE COIL (AIR).
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

HEATING SYSTEMS.
UNIT BLAST.
American Blower Co., Detroit, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

UNIT AIR.
Moline Heat, Moline, Ill.

GRAVITY AND FORCED CIRCULATION, WATER.
Alberger Heater Co., Buffalo, N. Y.
Gold Car Heating & Lighting Co., New York.

VACUUM.
Bishop & Babcock Co., Cleveland, O.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill
Sarco Co., New York.
Webster & Co., Warren, Camden, N. J.

VAPOR.
American Dist. Steam Co., No. Tonawanda, N. Y
Bishop & Babcock Co., Cleveland, O.
Dunham Co., C. A., Chicago, Ill.
Gold Car Heating & Lighting Co., New York.

If You Have Not a Set of Our Catalogs, Get It Today

Steam, Vacuum Compound, Altitude, etc.

"S&B" Thermometers all for applications

It is more than a catalog—it is a text book on Instruments for Indicating and Reading Pressure, Vacuum Draft, Temperature, etc.

Write for Special Catalog Set HV, Today

The Schaeffer & Budenberg Mfg. Co.
BROOKLYN, N. Y.

Chicago Pittsburgh Washington
St. Louis Philadelphia Los Angeles

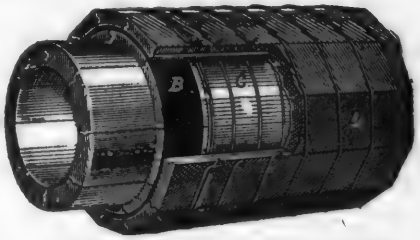
Also many other Allied Instruments, Gauge Boards and Complete Equipment

PYRO-BESTOS

Underground Pipe Insulation

For piping from central heating or power station to detached buildings of Universities, Asylums, Hospitals Factories, etc. Also an underground Pipe Conduit for heating private Auto garages direct from House heating systems.
Cannot rot or decay nor will it retain moisture to rust and destroy the piping during non-heating season.
Saves most coal, sends heat hotter and to a greater distance and by reason of its advanced common sense method of installation is at the same time a lower cost per foot of pipe covered than any other underground pipe Insulation on the market.

National Asbestos Mfg. Co.
Henderson St., South of Grand St., Jersey City, N. J.



A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

Cover Your Steam Pipes

WITH WYCKOFF'S IMPROVED

CYPRESS COVERING

Made of Gulf Cypress, the wood eternal

Not affected by wet and dry conditions common to steam-pipe trenches. Will not rot. Lasts twice as long as Pine Casing. Absolutely water and steam tight. Each shell is wound with heavy galvanized wire. Coated all over with the best known preservative—**Montezuma Asphalt.**
Let us answer your questions and tell you all about it. Booklet on request.

A. WYCKOFF & SON COMPANY

ELMIRA . . N. Y.

Atlanta, Ga.: 378 Piedmont Ave.

ENGINEERS' SPECIFICATION INDEX (Continued).

HEATING SYSTEMS (Continued)
Haines & Co., Wm. S., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Moline Heat, Moline, Ill.
Sarco Co., New York.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING APPARATUS, CENTRAL STATION.
American Dist. Steam Co., No. Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.
Hornung, J. C., Chicago, Ill.

HUMIDIFIERS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Philadelphia, Pa.
Carrier Air Conditioning Co., Buffalo, N. Y.
Carrier Engineering Corporation, New York.

HUMIDITY CONTROL.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Philadelphia, Pa.
Carrier Engineering Corporation, New York.

HYGROMETERS.
Taylor Instrument Cos., Rochester, N. Y.

INSTRUMENTS.
Electric Measuring.
Taylor Instrument Cos., Rochester, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Indicating and Recording.
Bristol Co., Waterbury, Conn.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Sarco Co., New York.
Taylor Instrument Cos., Rochester, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

INSULATING MATERIALS.
American Dist. Steam Co., No. Tonawanda, N. Y.
Century Conduit Co., Pittsburgh, Pa.
Hornung, J. C., Chicago, Ill.
John Manville Co., H. W., New York.
Monarch Metal Weather Strip Co., St. Louis, Mo.
National Asbestos Mfg. Co., Jersey City, N. J.
Ric-Wil Co., Cleveland, O.
Underground Specialties Co., New York.
Wyckoff & Sons, A., Elmira, N. Y.

LABORATORY TESTING APPARATUS.
Howard & Morse, New York.

MANOMETERS.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

MECHANICAL DRAFT APPARATUS.
American Blower Co., Detroit, Mich.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Plant Engineering & Equipment Co., New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

METERS.
Condensation.
American Dist. Steam Co., No. Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.
Hornung, J. C., Chicago, Ill.
Plant Engineering & Equipment Co., New York.

Feed Water.
Central Station Steam Co., Detroit, Mich.
Simmons Co., John, 110 Center St., New York.

Feed Water (Wier Type).
Webster & Co., Warren, Camden, N. J.

Pitot Tube.
American Blower Co., Detroit, Mich.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

Steam.
American Dist. Steam Co., No. Tonawanda, N. Y.

MOTORS.
Electric.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

PAINT, FOR HEATED SURFACES.
Ric-Wil Co., Cleveland, O.

PIPE.
Cast Iron.
American Cast Iron Pipe Co., Birmingham, Ala.
Clow & Sons, James B., Chicago, Ill.
Donaldson Iron Co., Emaus, Pa.
Glamorgan Pipe & Foundry Co., Lynchburg, Va.
Lynchburg Foundry Co., Lynchburg, Va.
Massillon Iron & Steel Co., Massillon, O.
National Cast Iron Pipe Co., Birmingham, Ala.
United States Cast Iron & Pipe Foundry Co., Burlington, N. J.

Soil.
Simmons Co., John, 110 Center St., New York.

Steel.
Simmons Co., John, 110 Center St., New York.

Wrought Iron.
Simmons Co., John, 110 Center St., New York.

Wood.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.
Buffalo Forge Co., Buffalo, N. Y.
Ohio Heating & Pipe Bending Co., Columbus, O.
Simmons Co., John, 110 Center St., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING, WOOD.
American Dist. Steam Co., No. Tonawanda, N. Y.
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE COILS.
Ohio Heating and Pipe Bending Co., Cleveland, O.

PIPE HANGERS.
Jenkins Bros., New York.
Simmons Co., John, New York.

PIPING, POWER.
Simmons Co., John, New York.

POWER PLANT SUPPLIES.
American Dist. Steam Co., No. Tonawanda, N. Y.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill
Johns-Manville Co., New York.
Ohio Heating and Pipe Bending Co., Cleveland, O.
Plant Engineering & Equipment Co., New York.
Simmons Co., John, New York.

PUMPS.
Boiler Feed.
Advance Pump & Compressor Co., Battle Creek, Mich.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Farnsworth Co., Conshohocken, Pa.
Yeomans Bros., Chicago, Ill.

Centrifugal.
Alberger Pump & Condenser Co., New York.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Economy Pumping Machinery Co., Chicago, Ill.
Plant Engineering & Equipment Co., New York.
Yeomans Bros. Co., Chicago, Ill.

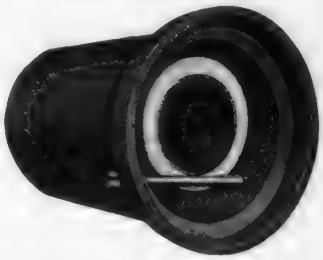
Condensation.
American Steam Pump Co., Battle Creek, Mich.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Thompson Mfg. Co., Des Moines, Ia.
Trane Co., La Crosse, Wis.
Yeomans Bros., Chicago, Ill.

Rotary.
Connersville Blower Co., Connersville, Ind.
Roots Co., P. H. and F. M., Chicago, Ill.
Thompson Mfg. Co., Des Moines, Ia.
United Vacuum Appliance Division, Connersville, Ind.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Steam.
Advance Pump & Compressor Co., Battle Creek, Mich.
American Steam Pump Co., Battle Creek, Mich.

CANNELTON
PATENTED
CONDUIT
FOR

Insulating Underground Steam and Hot Water Lines



Made of Fire Clay, Salt Glazed and thoroughly Vitrified. Simple method of installation, greatest efficiency, and longest life make it the choice of leading heating engineers today.

Write for descriptive booklet

CANNELTON SEWER PIPE CO., Cannelton, Ind., U. S. A.

MANUFACTURERS OF

Equipment and Supplies

FOR

Central Station Heating Plants

Copper Diaphragm Expansion Joints, Slip Joints, Anchor Crosses, Line Anchors, Collars, Manhole-Curbs, Pipe Guides, and The Detroit Condensation Meter

THE DETROIT FEED WATER METER

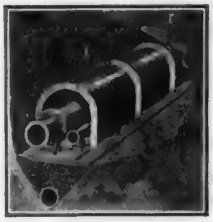
Central Station Steam Co., Detroit, Mich.

Chicago office, 902 First National Bank Bldg.
Minneapolis office, 801 Metropolit'n Life Bldg.

CENTURY!

Why Longer???

Economy
Durability
Accessibility



Catalogue and prices on application

CENTURY CONDUIT CO.
5602 Baum Blvd. Pittsburgh, Pa.

RIC-WIL Paint for Heated Surfaces

A brilliant black paint of superior preservative properties, dries hard yet is tough and elastic. It has a bond with clean metal that preserves its adhesion during contraction, expansion and bending.

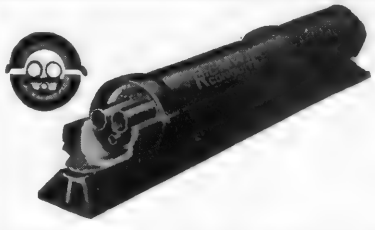
Lasts Much Longer than the Average Coating.
Especially Good for Underground Heating Pipes.
Let us send You a Free Sample to Test.

THE RIC-WIL COMPANY, Cleveland, O.

GOLD'S THERMOSTATIC HEAT REGULATING SYSTEM

Operated entirely by ELECTRICITY.
Each room is a unit by itself.
Does not depend on an air compressor.
Requires no attention whatever.
Is free from all troubles which usually affect such devices.

GOLD CAR HEATING AND LIGHTING CO.
17 Battery Pl. (Whitehall Bldg.) New York



For Underground Steam and Hot Water Pipes, the

SIMPLE
RIC-WIL METHOD

appeals to every man with common sense. It is a clean-cut, complete and ruggedly practical system of pipe insulation—not a makeshift scheme to utilize by-products. It is efficient up to 90%, which makes it economical. It is impervious to decay or deterioration, which makes it permanent. But best of all, it is simple and practical—the kind of material that highly trained technical men and practical operating engineers both approve. Bulletin No. 1 explains RIC-WIL simplicity and other features.

THE RIC-WIL COMPANY, Cleveland, O.

ENGINEERS' SPECIFICATION INDEX (Continued).

PUMPS (Continued)
Buffalo Steam Pump Co., Buffalo, N. Y.
Plant Engineering & Equipment Co., New York.
Pratt & Cady Co., Inc., Hartford Conn.

TURBINE.
Alberger Pump & Condenser Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Yeomans Bros. Co., Chicago, Ill.

VACUUM.
American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, O.
Buffalo Steam Pump Co., Buffalo, N. Y.
Connersville Blower Co., Connersville, Ind.
Economy Pumping Machinery Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
McAlear Mfg. Co., Chicago, Ill.
Roots Co., P. H. and F. M., Chicago, Ill.
Thompson Mfg. Co., Des Moines, Ia.
Trane Co., La Crosse, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros., Chicago, Ill.

PYROMETERS.
Bristol Co., Waterbury, Conn.
Taylor Instrument Cos., Rochester, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

RADIATORS, STEAM AND WATER.
American Radiator Co., Chicago, Ill.
American Pressweld Radiator Corporation, Detroit, Mich.
Gurney Heater Mfg. Co., Boston, Mass.
Simmons Co., John, New York.

RECEIVERS.
AIR.
American Dist. Steam Co., No. Tonawanda, N. Y.

CONDENSATION.
Advance Pump & Compressor Co., Battle Creek, Mich.
American Steam Pump Co., Battle Creek, Mich.
Economy Pumping Machinery Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
McAlear Mfg. Co., Chicago, Ill
Yeomans Bros., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.

REGULATORS.
BOILER-FEED.
Wright-Austin Co., Detroit, Mich.

DAMPER.
American Dist. Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, O.
Davis Regulator Co., G. M., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Moline Heat, Moline, Ill
Plant Engineering & Equipment Co., New York.
Sahlin Mfg. Co., Grand Rapids, Mich.
Trane Co., La Crosse, Wis.

PRESSURE.
American Dist. Steam Co., No. Tonawanda, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Gold Car Heating & Lighting Co., New York.
Hornung, J. C., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill
Mason Regulator Co., Boston, Mass.
Ross Valve Mfg. Co., Troy, N. Y.
Taylor Instrument Cos., Rochester, N. Y.

TEMPERATURE.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Carrier Engineering Corporation, New York.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., New York.
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sahlin Mfg. Co., Grand Rapids, Mich.
Sarco Co., New York.
Taylor Instrument Cos., Rochester, N. Y.

SEPARATORS.
STEAM.
American Dist. Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, O.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Plant Engineering & Equipment Co., New York.
Sims Co., Erie, Pa.
Vance-Vetter Co., Pittsburgh, Pa.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

SPRAY COOLING SYSTEMS.
Atmospheric Conditioning Corp., Philadelphia, Pa.

STRAINERS.
STEAM.
American Dist. Steam Co., No. Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill
Plant Engineering & Equipment Co., New York.
Wright-Austin Co., Detroit, Mich.

TEMPERATURE REGULATORS.
(See Regulators, Temperature).

TEMPERATURE RECORDERS, WET AND DRY-BULB.
Taylor Instrument Cos., Rochester, N. Y.

THERMOMETERS, RECORDING AND INDICATING.
Bristol Co., Waterbury, Conn.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Taylor Instrument Cos., Rochester, N. Y.

WATER.
Marsh & Co., Jas. P., Chicago, Ill.

THERMOSTATS.
Bishop & Babcock Co., Cleveland, O.
Bristol Co., Waterbury, Conn.
Johnson Service Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

TRAPS.
CONDENSER.
Farnsworth Co., Conshohocken, Pa.
RADIATOR.
Bishop & Babcock Co., Cleveland, O.
Dole Valve Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Co., H. W., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Moline Heat, Moline, Ill.
Sarco Co., New York.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

RETURN.
American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, O.
Dunham Co., C. A., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
McAlear Mfg. Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

STEAM.
American Blower Co., Detroit, Mich.
American Dist. Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, O.
Central Station Steam Co., Detroit, Mich.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Gold Car Heating & Lighting Co., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville Co., H. W., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Patterson-Kelley Co., New York.
Plant Engineering & Equipment Co., New York.
Sarco Co., New York.
Simmons Co., John, New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trane Co., La Crosse, Wis.
Vance-Vetter Co., Pittsburgh, Pa.

BOOKS ON HEATING AND VENTILATION

CENTRAL STATION HEATING. By Byron T. Gifford. Second edition. Important new chapters on costs and accounting, replacement and renewal reserve and how to figure it, and economics and design of high-pressure distribution systems are included in the new edition of this work, which presents the most advanced practice in central station heating, both steam and hot water. Central Station Heating is used as a guide in many States by the public utility commissions. 280 pages, with 46 illustrations, including 40 pages of miscellaneous engineering data. Size 6 x 9½ in., bound in cloth. Price $3.00.

DISTRICT HEATING. By S. Morgan Bushnell and Fred B. Orr. This book not only imparts a general knowledge of district heating, but contains many points on economical operation, as illustrated in the methods practiced by central cessful in this field. Comparative data are also station heating companies which have been sucpresented indicating the prices that can reasonably be charged for heating service. Size 6 x 9 in. 300 pages. 81 figs. Cloth, $3.00.

MECHANICAL EQUIPMENT OF FEDERAL BUILDINGS. By Nelson S. Thompson. Third revised edition, covering the basic data used by the Treasury Department in the design of the entire mechanical equipment of Federal Buildings under its control. Includes data on heating and ventilating, plumbing, drainage and water supply systems, gas piping, conduit and wiring systems, lighting fixtures, elevators, small power plants, motors and controlling apparatus, vacuum cleaning systems, operating data, etc. Size 6 x 9 in. 400 pages. Cloth, $3.00.

VENTILATING DUCTS. By C. E. Pearce. A set of six tables printed on heavy Bristol board, for rapidly estimating the superficial area and weights of galvanized iron rectangular ducts used in ventilating work. Size 7 x 9 in. Price, 50 cents.

MECHANICAL EQUIPMENT OF BUILDING. Vol. 1. Heating and Ventilation. By Louis A. Harding and Arthur C. Willard. One of the most complete treatises ever published on this subject. Written for the practicing engineer, as well as for the student. Size 7 x 9½ in., flexible binding. 621 pages and profusely illustrated. Price $5.00.

Vol. II. Power Plants and Refrigeration. An equally complete treatise, illustrating and describing in detail modern power-plant design and refrigerating practice. Size 6¼ x 9¾ in., flexible binding. 766 pages, many illustrations. Price $5.00.

Vol. III. Miscellaneous Building Equipment in preparation, including lighting, elevators, vacuum cleaning, sprinkler systems, plumbing, etc.

HEATING AND VENTILATION. By Prof John R. Allen and J. H. Walker. This is the latest work to make its appearance on this subject and is designed as a text book for use in the engineering and architectural schools, as well as for the practicing engineer and architect. Size 6 x 9 in., 305 pages. Cloth, $3.00.

PRACTICAL MANUAL OF STEAM AND HOT WATER HEATING. By E. R. Pierce. Especially useful to men engaged in installing steam and hot water heating apparatus. Easily understood and comprehensive. Boiler ratings exhaustively treated. 359 pages. Size 5½ x 8½ in. Cloth, $2.50.

PROGRESSIVE FURNACE HEATING. By Alfred G. King. A practical manual of designing, estimating and installing modern systems for heating and ventilating buildings with warm air. Written especially for contractors and mechanics. Size 6 x 9 in. 280 pages. 189 illustrations. Price, $2.50 postpaid.

PIPE FITTING CHARTS. By William G. Snow. A valuable reference work for the solution of knotty problems in connecting up steam radiators, boilers and the variety of appliances used in combination high and low pressure plants. 285 illustrations. Price, $2.00.

STEAM POWER PLANTS: Their Design and Construction. By Henry C. Meyer, Jr., M. E. Third edition, fully revised. One of the standard works on the design and construction of power plants. Covers proportioning boilers, selection and writing specifications for steam engines, selection and arrangement of auxiliaries, construction of chimneys, coal handling, etc. 219 pages. Size 6 x 9 in. Illustrated and with folding plates. Price, $2.00 postpaid.

DESIGNING HEATING AND VENTILATING SYSTEMS. By Charles A. Fuller. A text book which treats both the theoretical and practical side of the subject in a simple, but clear and comprehensive manner. Instruction given covering the design any kind of heating or ventilating system. 224 pages. Size 6 x 9 in. 78 figs. and 37 tables. Cloth, $2.00.

PRACTICAL STEAM AND HOT WATER HEATING. By Alfred G. King. Containing over 300 detailed illustrations. The book is a working manual for heating contractors, journeymen steam fitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $3.00.

MECHANICS OF HEATING AND VENTILATING. By Konrad Meier. Including a series of ten charts containing data relating to the flow of water, steam and air, collected by Mr. Meier during an experience of 26 years in heating and ventilating work, both in this country and abroad. Each of the charts replaces a series of tables on the subject, giving at a glance the result of a calculation from any combination of factors. 161 pages, illustrated, with ten large charts. Size 6 x 9 in. Price, $5.00. Separate sets of charts, printed on cloth, with lines in different colors and mounted on boards. Single charts, $1.50. Sets of ten, $15.00.

HEATING AND VENTILATING BUILDINGS, a standard manual for heating engineers and architects. By Prof. R. C. Carpenter. Sixth edition, largely rewritten. 577 pages, 277 illustrations, 8vo, cloth, $3.50.

HANDBOOK FOR HEATING AND VENTILATING ENGINEERS. By Prof. James D. Hoffman and Benjamin F. Raber. The latest book on this subject. Unusually comprehensive. 320 pages, with 45-page appendix. Size 4½ x 6¾ in., bound in flexible leather. Price, $3.50.

ADDRESS
The HEATING and VENTILATING MAGAZINE 1123 Broadway NEW YORK

ENGINEERS' SPECIFICATION INDEX (Continued).

TRAPS (Continued)

VACUUM.
American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, O.
Dunham Co., C. A., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., New York.
Webster & Co., Warren, Camden, N. J.

TURBINES, STEAM.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURBO-BLOWERS.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

UNDERGROUND PIPE CONDUITS.
American Dist. Steam Co., No. Tonawanda, N. Y.
Cannelton Sewer Pipe Co., Cannelton, Ind.
Century Conduit Co., Pittsburgh, Pa.
Hornung, J. C., Chicago, Ill.
National Asbestos Mfg. Co., Jersey City, N. J.
Ric-Wil Co., Cleveland, O.
Underground Specialties Co., New York.
Wyckoff & Son Co., A., Elmira, N. Y.

VACUUM CLEANING APPARATUS.
American Radiator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
United Vacuum Appliance Division, Connersville, Ind.

VALVES.

AIR (Automatic).
American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Gold Car Heating & Lighting Co., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Hoffman Specialty Co., New York.
Simmons Co., John, New York.

AIR RELIEF.
American Dist. Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
Webster and Co., Warren, Camden, N. J.

BACK PRESSURE.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
Simmons Co., John, New York.

BALANCED.
American Dist. Steam Co., No. Tonawanda, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Il.

BLOW-OFF.
Jenkins Bros., New York.
Illinois Engineering Co., Chicago, Ill.
Pratt & Cady Co., Inc., Hartford, Conn.
Simmons Co., John, New York.
Vance-Vetter Co., Pittsburgh, Pa.

CHECK.
Jenkins Bros., New York.
Pratt & Cady Co., Inc., Hartford, Conn.
Simmons Co., John, New York.

GATE.
American Dist. Steam Co., No. Tonawanda, N. Y.
Dole Valve Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Erie, Pa.
Pratt & Cady Co., Inc., Hartford, Conn.
Simmons Co., John, New York.

GLOBE, ANGLE AND CROSS.
Dole Valve Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Erie, Pa.
Pratt & Cady Co., Inc., Hartford, Conn.
Simmons Co., John, New York.

HYDRAULIC-OPERATING.
Vance Vetter Co., Pittsburgh, Pa.

VALVES (Continued)

NON-RETURN.
Bishop & Babcock Co., Cleveland, O.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
Pratt & Cady Co., Inc., Hartford, Conn.
Simmons Co., John, New York.

RADIATOR.
American Radiator Co., Chicago, Ill.
American Dist. Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, O.
Commonwealth Brass Corporation, Detroit, Mich.
Detroit Lubricator Co., Detroit, Mich.
Dole Valve Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Gold Car Heating & Lighting Co., New York.
Gorton & Lidgerwood Co., New York.
Gurney Heater Mfg. Co., Boston, Mass.
Jenkins Bros., New York.
Johns-Manville Co., H. W., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Erie, Pa.
Pratt & Cady Co., Inc., Hartford, Conn.
Simmons Co., John, New York.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

REDUCING.
American Dist. Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, O.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Powers Regulator Co., Chicago, Ill.

REGULATING.
American Dist. Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, O.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Plant Engineering & Equipment Co., New York.
Ross Valve Mfg. Co., Troy, N. Y.

SAFETY.
American Dist. Steam Co., North Tonawanda, N.Y.
Gold Car Heating & Lighting Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.

STOP AND CHECK (See Valves, Non-Return).

VENTILATING HEATERS.
American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Hersh & Bro., Allentown, Pa.
Clarage Fan Co., Kalamazoo, Mich.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATING SYSTEMS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Philadelphia, Pa.
Buffalo Forge Co., Buffalo, N. Y.
Hersh & Bro., Allentown, Pa.
Carrier Engineering Corporation, New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Moline Heat, Moline, Ill.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS.
Buffalo Forge Co., Buffalo, N. Y.
Buckeye Blower Co., Columbus, O.
Hersh & Bro., Allentown, Pa.
Johns-Manville Co., H. W., New York.

MUSHROOM.
American Foundry & Furnace Co., Bloomington, Ill.

ROOF.
Hersh & Bro., Allentown, Pa.

WEATHER STRIPS, METAL.
Monarch Metal Weather Strip Co., St. Louis, Mo.

The Sole Survivor

IN Lockport, N. Y., where the first underground Central Station Steam Heating System was installed more than forty years ago, the American District Steam Company constructed mains, using nearly every known method of insulation, for purposes of experimenting and testing the efficiency and durability of various materials.

Every insulating material possible to obtain in the open market has been used in connection with brick conduits, cement conduits and also with vitrified pipe, wood boxing and round wood casings of various thicknesses. Elaborate condensation and radiation tests have been made with each material.

By far the best results were obtained by covering the wrought iron pipe with sheet asbestos and enclosing this in round, tin lined wood casing, having a thickness of 4 inches, with "dead" air space of at least 1 inch between the tin and the asbestos covering the pipe. This is the only method that survived and is the one adopted for our own work. It is called our STANDARD INSULATION.

Variators
Expansion Joints
Anchors and Guides
Angle Joints
Slotted Angle Flanges
Adjustable Annular Wedges
Manhole Curbs
Steam Traps
Condensation Meters
Steam Meters
Separators

Write for copy of Bulletins giving full information regarding installation of underground heating mains.

AMERICAN DISTRICT STEAM COMPANY

General Office and Works:
NORTH TONAWANDA, N. Y.

NEW YORK **CHICAGO** **SEATTLE**

ADVERTISERS' INDEX

Advance Pump & Compressor Co..... 19
Alberger Heater Co..... 102
Alberger Pump & Condenser Co..... 103
American Blower Co..... 87
American District Steam Co..... 113
American Foundry & Furnace Co..... 85
Amer. Pressweld Radiator Corporation..... 13
American Radiator Co..... 71
American Steam Pump Co..... 19
American Technical Society..... 81
Atmospheric Conditioning Corporation..... 86
Badger & Sons Co., E. B..... 105
Bayley Mfg. Co..... 94
Bishop & Babcock Co., The..... 12
Bristol Co., The.....Front Cover
Buckeye Blower Co..... 92
Buffalo Forge Co..... 89
Cannelton Sewer Pipe Co..... 109
Carrier Engineering Corporation..... 88
Cast Iron Pipe Publicity Bureau..... 4
Central Station Steam Co..... 109
Century Conduit Co..... 109
Chicago Pump Co..... 80
Clarage Fan Co.....Second Cover
Commonwealth Brass Corporation..... 14
Connersville Blower Co..... 3
Davis Regulator Co.....Front Cover
Detroit Lubricator Co..... 79
Dolve Valve Co.....Front Cover
Dunham Co., C. A..... 22
Economy Pumping Machinery Co..... 101
Farnsworth Co..... 99
Fulton Co., The..... 9
Gold Car Heating and Lighting Co..... 109
Gorton & Lidgerwood Co..... 14
Gurney Heater Mfg. Co.....Front Cover
Haines & Co., Wm. S..... 13
Hersh & Bro..... 96
Hoffman Speciality Co.....Fourth Cover
Hornung, J. C..... 101
Howard & Morse..... 77
Ilg Electric Ventilating Co..... 78
Illinois Engineering Co..... 20
Illinois Malleable Iron Co..... 9
International Heater Co..... 98
Jenkins Bros..... 83
Johnson Service Co..... 22
Johns-Manville Co., H. W..... 83
Marsh Co., Jas. P..... 3
Marsh Valve Co..... 82
Mason Regulator Co.....Front Cover
Massachusetts Blower Co..... 93
McAlear Mfg. Co..... 20
Moline Heat..... 6
Monarch Metal Weather Strip Co..... 7
Nash Engineering Co..... 76
National Asbestos Mfg. Co..... 107
New York Blower Co..... 90
Ohio Heating and Pipe Bending Co..... 80
Patterson-Kelley Co..... 100
Plant Engineering & Equipment Co..... 101
Power Regulator Co..... 84
Pratt & Cady Co., Inc..... 5
Ric-wiL Co..... 109
Roots Co., P. H. & F. M..... 113
Ross Heater & Mfg. Co..... 100
Sahlin Mfg. Co..... 96
Sarco Co..... 12
Schaeffer & Budenberg Mfg. Co..... 107
Shur-Tite Mfg. Co..... 8
Simmons Co., John..... 5
Sims Co., The..... 103
Sixth City Sheet Metal Works Co..... 85
Skinner Brothers, Mfg. Co.....Third Cover
Sturtevant Co., B. F..... 91
Taylor Instrument Co..... 97
Thompson Mfg. Co..... 19
Trane Co..... 11
United Vacuum Appliance Division..... 97
Underground Specialties Co..... 105
Vance-Vetter Co..... 98
Webster & Co., Warren..... 10
Westinghouse Electric & Mfg. Co..... 95
Whitlock Coil Pipe Co..... 102
Wright Austin Co..... 10
Wyckoff & Son Co., A..... 107
Yeomans Bros. Co..... 99

ROOTS

ROTARY POSITIVE BLOWERS
GAS EXHAUSTERS
PUMPS AND VACUUM PUMPS

FLEXIBLE COUPLINGS
BLAST GATES
RELIEF VALVES
FEED DEVICES
GOVERNORS

PRODUCTS

Positive Circulation

Positive Circulation of steam to the radiators in vacuum heating systems is necessary for economical and satisfactory results especially when fires are banked.

ROOTS

ROTARY VACUUM PUMPS

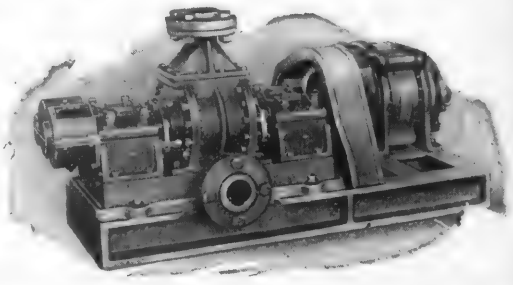
are electric driven, providing accurate control of temperature at all times.

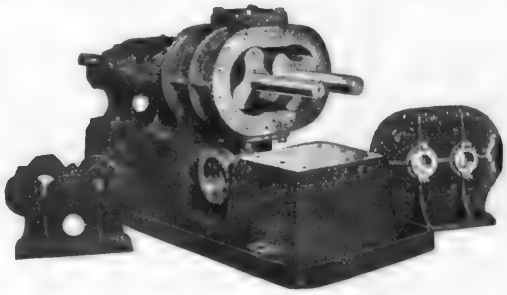
Write today for Bulletin 64

P. H. & F. M. ROOTS CO.
Connersville, Ind.

Chicago:
Peoples Gas Building

New York,
120-122 Liberty Street





We have a pardonable pride in the class of buildings which Connersville Valveless Vacuum Pumps are serving.

The No. 12H bulletin contains a representative list of installations and gives many reasons why this is the logical pump for return line vacuum heating work.

Bulletin also shows how the piping should be arranged under different conditions and will materially aid you in properly laying out a system.

Ask for your copy today.

The Connersville Blower Company

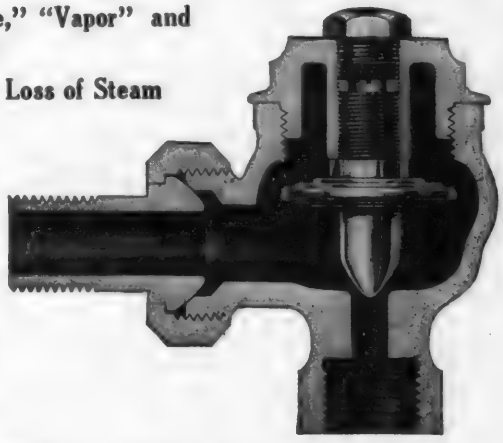
Connersville Indiana U.S.A.

Chicago, Monadnock Block New York, 114 Liberty Street

Marsh Reflux Junior Thermostatic Traps

For Radiators and Coils of "Low Pressure," "Vapor" and "Vacuum Heating Systems"

Freely Discharges Air and Water Without Loss of Steam



THE Marsh REFLUX Return Line Trap is for use on the return end of radiators of low pressure, vapor and vacuum systems of heating. It is the result of a careful investigation into the actual requirements that must be fulfilled by a radiator return valve, in order that it may accomplish what is desired of it, namely, to free the radiator of air and water without the loss of steam and to do so noiselessly.

The Marsh Reflux Junior Thermostatic Trap is recommended for small radiators and coils. This Trap for the small and the Original Reflux for the large units will make an ideal job. Especially adaptable for two pipe gravity work and vapor systems.

May be furnished either outside adjustment (as illustrated) or with concealed adjustment.

Write for literature fully describing this trap.

JAS. P. MARSH & CO., 118-124 South Clinton Street Chicago

Established 1865

Manufacturers of Gauges for all Pressures and Purposes Automatic Air Valves and Steam Specialties

Cast Iron Pipe

Stands the Test of Unusual Service

The pipe shown here is serving in one of the largest plants of its kind in the world, handling copper ammonia solution, and replaced pipe to which the corrosive effects of the solution were fatal in a few weeks.

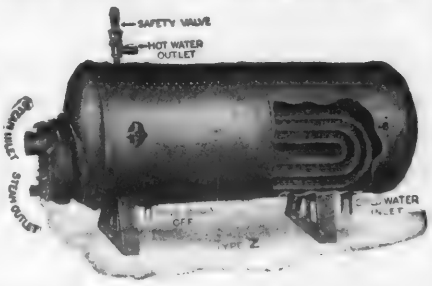
More than a year after its installation the Chief Metallurgist of the plant says, "The cast iron pipe shows no evidence of corrosion."

The history of cast iron pipe is a history of satisfactory service, full of instances of unusual problems solved—of superior resistance to various chemicals, acids, alkalis, etc.

The Cast Iron Pipe Publicity Bureau
1 Broadway - New York

Hot Water When It's Wanted

You can assure your clients all the hot water they desire in hotels, hospitals, bakeries, bleacheries, laundries, dye works and public buildings equipped with a P. & C. (Davis) Hot-Water Service Heater, for we make the heating capacity, in relation to the storage, suit conditions of each job.



P. & C. (Davis) Hot-Water Service Heater

also frees water from all impurities except those which can only be removed by evaporation.

Many of these Heaters installed nearly a half century ago are still in service.

Our Heating Engineers will gladly consult with Architects and Engineers on any installation problem, such as the consumption of water, layout of job, etc.

Write nearest branch for booklet.

PRATT & CADY CO., INC. *Manufacturers of Valves, Asbestos Packed Cocks, Feed-Water Heaters, Hot-Water Generators, Hot-Water Service Heaters, and Power Pumps*

Boston Cleveland Hartford New York Pittsburgh Representatives in
Chicago Detroit Minneapolis Philadelphia San Francisco all large cities

"SIMMONS SERVICE"

Iron Pipe - Valves - Fittings

Pipe Bends and Coils

Steam Specialties

Fire Equipment

Large Stocks on Hand at all Times

Brass; Iron Pipe Size - Extra Heavy Bronze Fittings

JOHN SIMMONS CO.

110 Center Street, New York City

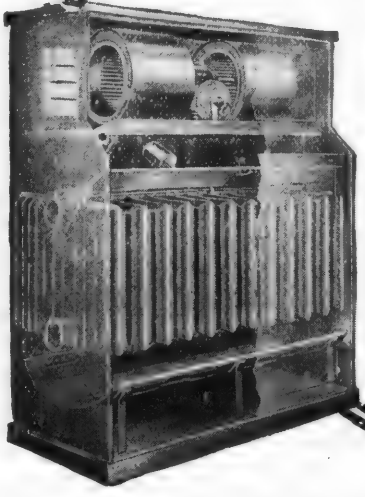
A GOOD LINE of Equipment for YOU to sell—

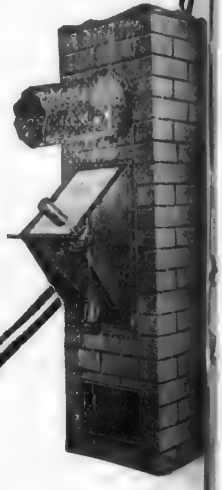
Moline Heat

Moline Heat — System of Steam Circulation and Control

UNIVENT — Last Word in Combined Heating and Ventilating

Liberty Draft Controller— and other products



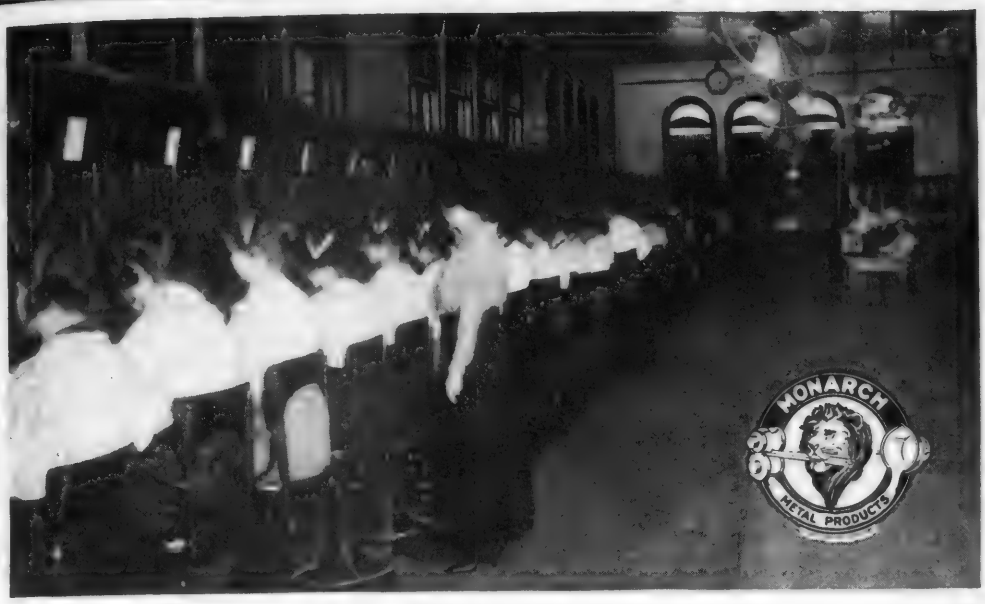


Write for Complete Line of Catalogs TODAY

Address Dept. F

MOLINE HEAT

Moline, Ill.



Look up "Monarch" in the Phone Book

The chances are that the very telephone exchange through which your message flashes is protected from noise, and soot, and cold by Monarch Metal Weather Strip—as many Bell Exchanges including the largest one in the world, are Monarch-equipped and, therefore, Monarch-protected.

Look up "Monarch" in the phone book today, or write us for name of our nearest representative—and let him explain how Monarch Strips can save money for you and add to the comfort and health of your family, or employes, or customers.

"Monarch Outstrips 'em All"

Bell Telephone Engineers selected Monarch Strips as their one standard—because nowhere else could they get their two-piece, tubular Monarch construction—with one strip, on the sash, acting as a curved track for the other, on the frame—the two strips interlocking to form an easy-sliding, flexible but permanent and air-tight seal.

Monarch Strips keep cold, noise, soot, dirt and germs outside—keep heat inside—and save enough coal to make the luxury and comfort of their use a by-product of True Economy.

Look up "Monarch" in the phone book today. Or, if it's not there, write us direct.

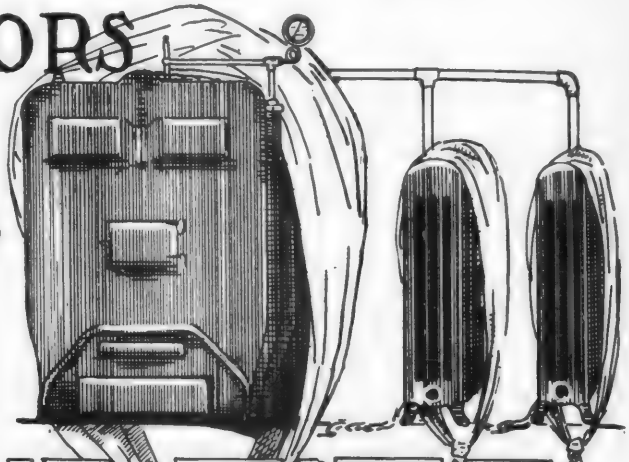
Monarch Metal Weather Strip Co., 5000 Penrose St., St. Louis, U. S. A.

Manufacturers also of Casement Window Hardware

MONARCH
METAL WEATHER STRIPS

SICK BOILERS AND RADIATORS

can be cured with



SHUR-TITE

boiler, pipe, and radiator cement

You take medicine when you are sick.

SHUR-TITE is medicine for boilers or radiators out of order because of leaks which most frequently occur in new installations, and in old ones as well.

It is a composition of *dry* chemicals which, placed in steam, water or vapor heating systems, will find and *permanently* repair all leaks.

It is guaranteed to do this.

In this age of the great post-war building activity SHUR-TITE is coming to the front.

No fitter will want to be without this great trouble and money saving tool in making new heating installations.

The bigger, better jobbers and dealers of the country are already stocking their shelves, knowing as they do, SHUR-TITE is endorsed by heating engineers as the best and surely positive means of stopping leaks in heating equipment.

Drop us a line, no matter your connection in the heating trade, you'll be interested in SHUR-TITE.

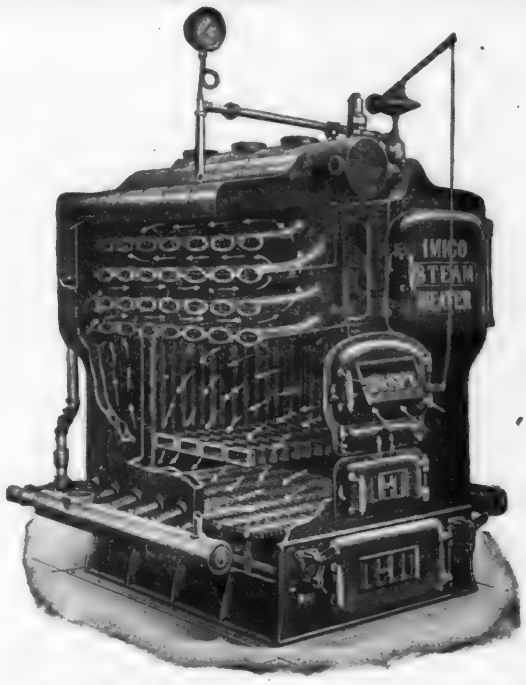
SHUR-TITE MANUFACTURING COMPANY, Cleveland, Ohio

IMICO
Heating Boilers

Smokeless

DOWN DRAFT

For Water or Steam



Our Catalogue describing our complete line of Heating Apparatus sent on request

ILLINOIS MALLEABLE IRON CO., Chicago

TO a limited number of high class manufacturers' agents we can offer liberal commissions, and exclusive territory on a number of new additions to the Sylphon Line, which cannot well be sold through our present channels.

Write direct to factory, giving references and territory wanted.

The Trade will be interested to know that these new agents will also sell Sylphon Regitherms, Tank Regulators, Reducing Valves and Packless Graduated Radiator Valves.

THE FULTON CO.

KNOXVILLE, TENN.

Inefficient Heating Systems in Old Buildings can be Remodeled at Comparatively Small Cost into Efficient WEBSTER Systems

NOW is the time to act in order to derive full benefit and economy for adequately heating buildings next winter, without carrying several pounds back pressure on the engines or using an undue amount of live steam.

From present indications, there will be a great scarcity of coal during the coming cold months. Prepare NOW to overcome this by installing the WEBSTER System.

At comparatively small cost and without extensive alterations or seriously impairing the operation of any department—the unsatisfactory heating system can be changed over in a short time into the efficient

Webster

Vacuum System of Steam Heating

Over 11,000 successful installations in all classes of buildings during the past 30 years. A large part of these were changed over from old heating systems. A return of from 25 to 50 per cent has often been realized on the investment required for changing over a poorly designed heating system into the efficient WEBSTER System.

The WEBSTER System provides perfect circulation of exhaust steam, live steam or a combination of the two through every radiator or pipe coil without appreciable back pressure on the engine, or noise, odor, air binding and other objectionable features.

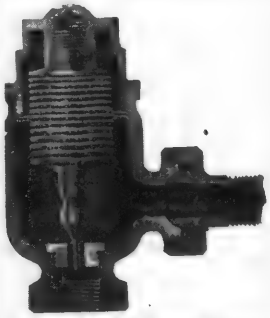
We co-operate with the architect, consulting engineer, heating contractor or owner to help secure the best and most economical results at the least possible cost.

The Webster Guarantee is the Owner's Insurance Policy

Write TODAY for a copy of our Catalog V-37

Heating the Manufacturing Plant by the Webster System

WARREN WEBSTER & COMPANY



Webster Sylphon Trap for Radiator Returns and at Drip Points

MANUFACTURERS

Webster Systems of Steam Heating, Webster Feed Water Heaters, Webster-Lea Heater-Meters, Webster Steam and Oil Separators and Webster Steam Specialties

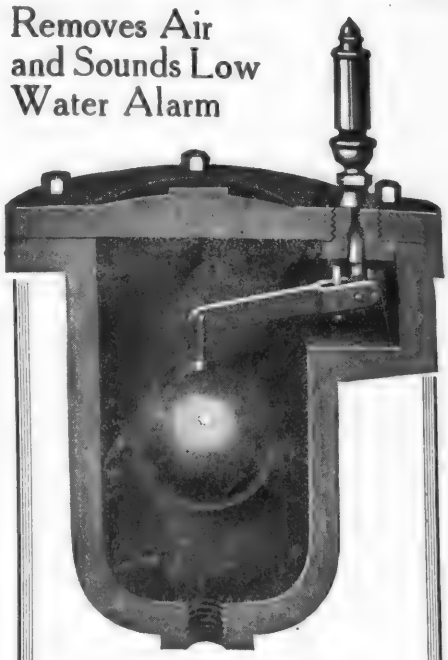
MAIN OFFICE AND WORKS

CAMDEN, N. J.

Branch Offices in 30 Cities

Fuel Conservation Specialists for Thirty Years

Removes Air and Sounds Low Water Alarm



IN addition to its wide application for removing air from water under pressure the

Wright Air Trap

is especially adapted for taking air from closed water receivers, and sounding an alarm when the water in closed tanks reaches a lower point than is desired

Size of Trap, 6 x 7; inlet, ¾ in.

Send for catalog

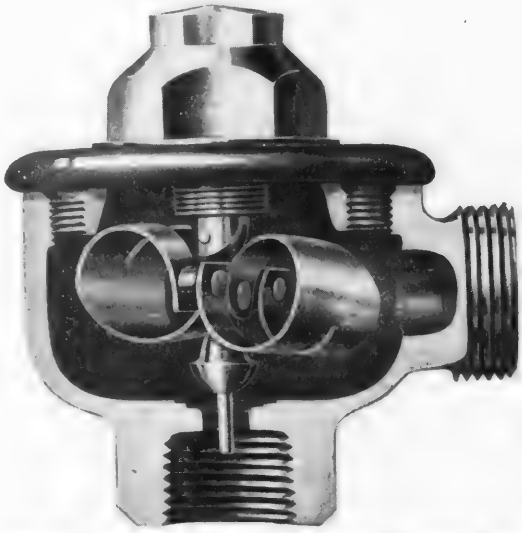
WRIGHT-AUSTIN CO.
76 Woodbridge Street
Detroit, U. S. A.

Branch Offices:
New York Atlanta Chicago Boston

Representatives Everywhere

Science and Ingenuity

have produced this new Radiator Trap



THE TRANE THERMETAL TRAP

NO DIAPHRAGM
PERFECT OPERATION

ALL METAL
EVERLASTING

Write for Bulletin No. 6

THE TRANE COMPANY

MAIN OFFICE:
103 So. 6th St., La Crosse, Wis.

CHICAGO OFFICE:
175 W. Jackson Boulevard

LA CROSSE TRANE WISCONSIN

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Why It Outwears Others

The annularly corrugated tubes, used in the diaphragm of ordinary radiator traps, contract and expand to the maximum degree at a *given point*. And as the movement at that point is considerable, the life of the traps is naturally limited.

In the SARCO diaphragm a spirally corrugated tube of large diameter is used. Consequently, when the tube is expanded or contracted the movement is *equal on every turn* of the spiral. The result is that you get longer wear out of the

SARCO Radiator Trap

Another point where the SARCO outwears others is in the valve head, which consists of a bronze ball that turns freely in a socket. This construction insures a perfect seat and offers a wearing surface many times that of others.

The large surface of the strainer is another improvement. This prevents clogging and protects the valve head and seat, eliminating practically all wear. And having a discharge area about *ten* times that of the valve itself, there is little danger of the strainer becoming stopped up, thus doing away with the necessity of cleaning same except at long intervals.

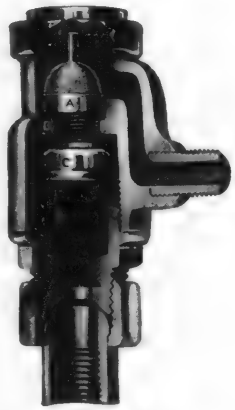
Other advantages are described in Booklet P34. Shall we send it?

SARCO COMPANY, Inc.
231 Broadway, New York City

Ellicott Square, Buffalo — Monadnock Block, Chicago — Williamson Bldg., Cleveland
Majestic Bldg., Detroit — Drexel Bldg., Philadelphia — Peacock Bros., Montreal

Service **The B & B Line** Quality

THE WORLD'S MOST COMPLETE LINE



The B & B VacUstat

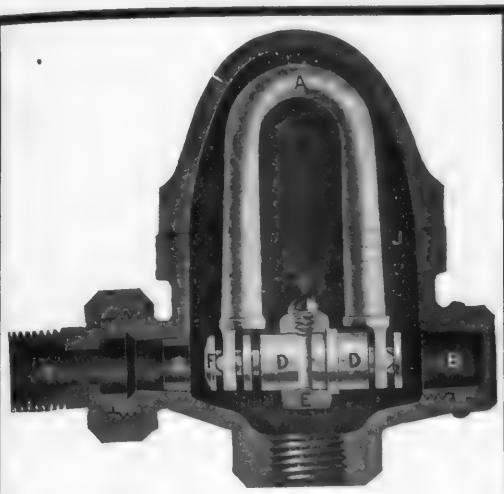
Three to four times the venting capacity of the ordinary air valve is furnished by

The B & B VacUstat

Here is a thermostatic valve entirely different from other air valves. With its large venting capacity, the VacUstat secures rapid air removal, assuring quick heating at all times.

Send for Our Engineering Data Book No. HV

The Bishop & Babcock Co.
General Offices and Factories:
Cleveland, Ohio



Correct Principles

of engineering design are embodied in the

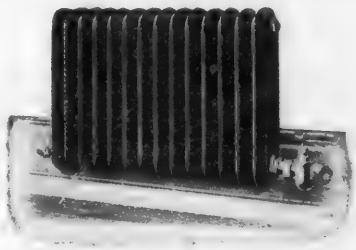
VENTO
Automatic
Valves and Traps

In this trap ample power of expansion and contraction is combined with an extreme sensitiveness to temperature variations.

Of Simple and Rugged Construction, with Easy Access to all Parts

Guaranteed absolutely for a period of 5 years, when used on Vacuum or Low-pressure Heating Systems

WM. S. HAINES & CO.
PHILADELPHIA, PA.



PRESSWELD
IS A
CONVECTOR

Pressweld does more than radiate heat. It is a heat *convector*. The large open spaces between the sections permit immense volumes of air to come in contact with the heated surface of the radiator. Consequently, less heat is radiated to the walls,

More Air is Heated and Convected

Rapid circulation of this heated air maintains an even temperature throughout the room. No extremes are found at top and bottom.

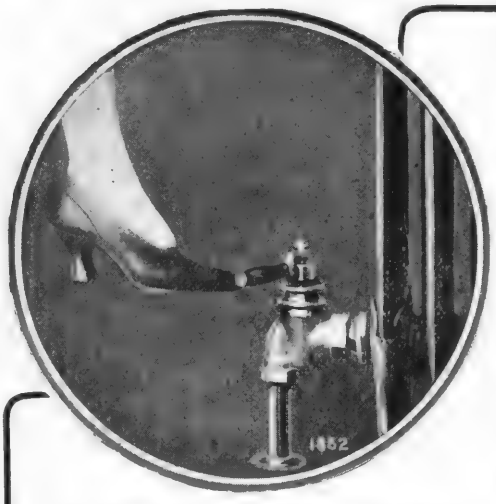
Floor and Ceiling Temperature More Uniform

Rapidly circulated air is widely known to be more healthful. The fuel economy is quickly apparent. Pressweld Convectors, therefore, contribute to both

Fuel Economy and Health

You'll find some interesting facts regarding convection in the new Pressweld catalog. Write Dept. "D" for your copy. Why not send at once?

AMERICAN PRESSWELD RADIATOR CORPORATION
Detroit, Michigan



No stooping, the slightest touch of the foot operates the valve.

A Quarter Turn of the Handle

OPENS OR CLOSES THE

GORTON

QUARTER TURN

VALVE

It is the easiest operating valve in the world, and users will regulate heat in a room by opening and closing the radiators, saving steam.

With the old time valve requiring five or six turns of the wheel to open or close the valve they open the windows to cool a room, an immense waste of steam.

Wasted steam is wasted coal.

Equip your radiators with Gorton Valves and save money on your Coal Pile.

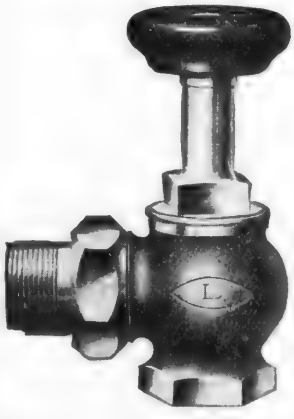
Write for Catalogue

Gorton & Lidgerwood Co.

FISHER BUILDING, CHICAGO, ILL.

100 LIBERTY STREET, NEW YORK, N. Y.

See Sweet's Architectural Catalogue, Page 1635, for Specifications.



Leadership

in any industry is only acquired through actual superiority in methods, material and merchandise.

In making the

Lavigne Packless Quick-Opening Steam Radiator Valve

we employ the most modern methods, the best materials obtainable, and the result is a quality of merchandise which has stood the acid test of eleven years' rigorous usage.

These valves excel because:

They *positively do not leak* Steam, Water, or Air
They open and close with 7/8 turn of the handle
They are handsome in appearance and an ornament to any job

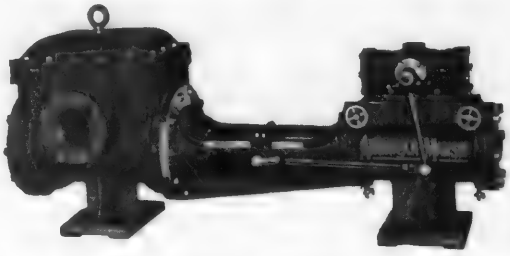
BUILT RIGHT - TO STAY TIGHT

Made in six sizes; many styles of handles
All good jobbers handle them

COMMONWEALTH BRASS CORPORATION, Detroit, U. S. A.

American-Marsh Vacuum Pumps
For Heating Systems

Positive **Simple**



Reliable **Efficient**

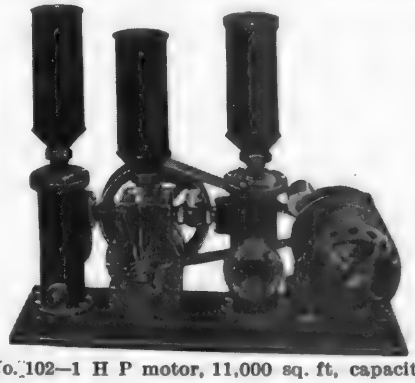
Equipped with an improved steam valve which is especially adapted for vacuum service. American-Marsh Pumps are positive in action, possess a perfect governing element and will not hang up under all the varying conditions.

Ask for Bulletin No. 24

AMERICAN STEAM PUMP CO.
Battle Creek, Mich.

Our slogan: Simplex not Duplex. "To be simple is to be great."

Thompson Vacuum Pumps



No. 102—1 H P motor, 11,000 sq. ft. capacity

Simple—Sturdy—Silent

Complete equipment and assembled and tested at factory. Shipped to job assembled ready to operate.

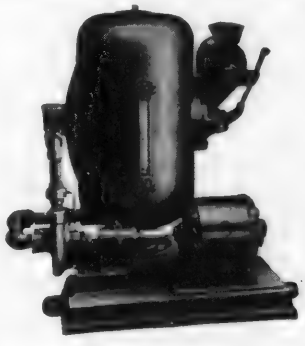
The only rotary vacuum pump which will either maintain a vacuum of 20" or discharge against a 20 lb. boiler pressure.

Equipment sizes range from 5,000 to 35,000 sq. ft. radiation. Send for bulletin B-3

THOMPSON MANUFACTURING CO.
811 24th Street Des Moines, Iowa

"ADVANCE" CONDENSATION PUMPS

For Low Pressure andVapor Heating Systems



Electric Motor Driven, Automatic in Operation

Obtain absolute protection against overloading and burning out of motor by using "ADVANCE" Condensation Pump and Receiver Equipment.

Write now for Bulletin HV-205

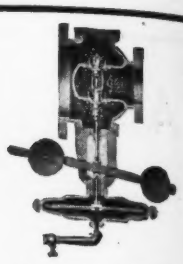
Advance Pump and Compressor Co.
BATTLE CREEK, MICH.

JOHN DAVIS CO.

Eclipse

STEAM SPECIALTIES

THE STANDARD
FOR OVER 35 YEARS



Vacuum Type
Reducing Valve

Valves for the Automatic Control of Steam

Pressure Reducing Valves—all types—all services
Back Pressure and Atmospheric Relief Valves—2" to 36" diameter
Non-Return, Stop and Check Valves, Steam Traps
Steam and Oil Separators—all types. Etc., etc., etc.

WRITE FOR BULLETINS

The Heart of the Valve
Eclipse Adjustable
Piston Automatically
Seats Tight

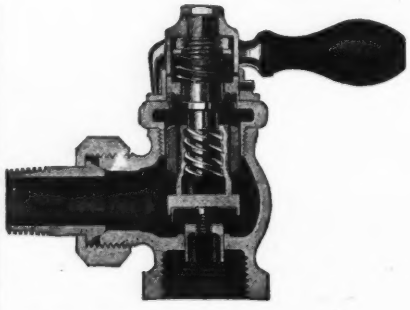
ILLINOIS ENGINEERING CO.
CHICAGO
Represented in 20 Principal Cities

McALEAR SPECIALTIES

A COMPLETE LINE
for all Steam Heating and Power Plants

Built on the proposition that QUALITY rather than PRICE should determine the selection of heating devices

25 YEARS OF KNOW HOW



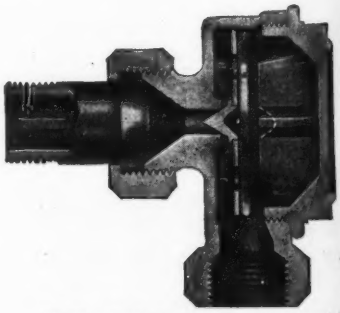
McAlear Packless Graduated Valve not only the handsomest graduating valve but the simplest and of the best construction of any valve on the market.

are embodied in the McAlear System of Vacuum and Vapor Heating.

It will pay you to get acquainted with the McAlear line.

Send for New Catalogue, No. 25

McAlear Mfg. Co.
1901-7 So. Western Ave.
CHICAGO, ILL.



McAlear Perfection Radiator Trap will close tight against a steam pressure of 50 lbs. when discharging direct to the atmosphere, or into a vacuum of from 1 to 25 in.

Showing installation of Skinner Heaters in garage of Anheuser-Busch Brewing Ass'n, St Louis, Mo. Note extensive area served.

Heat your Plant at least cost

The Skinner Bros. (Baetz Patent) Heating System provides a constant and uniform distribution of heat, at less cost, than any known system now in use.

As no distribution pipes or ducts are required, installation cost is 15 to 50% less than any other system. Power consumption is only 20% of the capacity of power units supplied with the average installation. Maintenance costs are lower because of the compactness and centralized design of the heating coil. No special foundation required other than provided by ordinary floor construction. Requires less floor space than any known system, and is easily installed by common labor. Is portable in the fullest sense of the word and can therefore be easily relocated in any part of the plant.

The Baetz principle follows natural laws in every case and is therefore positive and simple in its heating. Read the brief description at the left, under the heading "Mechanical Features."

Mechanical Features

The Skinner Bros. (Baetz Patent) Heating System consists essentially of a large steam pipe coil compactly mounted above a centrifugal fan wheel, both housed as a single unit within a heavy structural and sheet-steel casing.

Either exhaust or live steam (of high or low pressure) is conducted through the coil, and the cool air near the floor level, or from the outside, is exhausted by the fan and impelled around and through the various coil sections. The air, after thus being warmed, is discharged at low velocity through the outlet hood into the open building space. No galvanized iron ducts or pipes are used for air distribution, and as the air is not discharged under high pressure, it does not disturb floor dust nor create uncomfortable drafts.

The warm air is not confined to a zone immediately surrounding the heaters, but the heat penetrates to the furtherest corners of the open area and maintains an even, comfortable average temperature at al points.

Made in six styles and sizes. Where no steam plant is available, we supply our direct-fired type DF, in two styles and sizes.

Operated by any power available—motor, either belted or direct, engine or line shafting.

Sold Under Positive Guarantee

Send for pamphlet No. 50, describing various uses, and for No. 80, giving list of installations. If possible, send blue print or pencil dimension sketch of foundry to be heated and state steam pressure available to enable our Engineering Department to quote on the proper size required.

Skinner Bros. Mfg. Co., Inc.
1026 Tyler Street St. Louis, Mo.

SKINNER BROS.

BAETZ PATENT HEATING SYSTEM

Skinner Brothers Mfg. Co., Inc.
1026 Tyler Street
St. Louis, Mo.

Please send us your illustrated booklet on Skinner Bros. Heating Systems and full particulars.

Firm_____

Address_____

Attention Mr._____

For what purpose building used—

No. 8 Hoffman
Return Line Valve

The Satisfactory Heating which is vital to the success of any building is governed in steam heating systems by the Venting Valves

So it is the Venting Valves that constitute your real heating problems

HOFFMAN VALVES

Hoffman Valves have successfully passed the severest service tests that engineering skill could devise. They have made good on big jobs and little ones—in all kinds of buildings—because there is a Hoffman Valve for every type of steam-heating service.

Hoffman Valves are sold with a five years' guarantee. If they do not give complete satisfaction the full purchase price will be returned.

Send for the Heating Engineer's Edition of our Catalog, showing typical installations.

Hoffman Specialty Co., Inc.

512 FIFTH AVENUE, NEW YORK CITY

CHICAGO
130 N. Wells St.

LOS ANGELES
215 W. Seventh St.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*